AR TARGET SHEET

The following document was too large to scan as one unit, therefore, it has been broken down into sections.

EDMC#: 0062224
SECTION: 2 OF 2

DOCUMENT #:

TITLE: Draft Dangerous and/or Mixed Waste RD&D Permit; Demonstration Bulk Vitrification System

PERMIT ATTACHMENT GG

Recordkeeping and Reporting – Section 9 of the Permit Application

Permit Number: WA 7890008967

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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CONTENTS

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9.0 RECORDKEEPING AND REPORTING

9.1 GENERAL

Recordkeeping and reporting for the RD&D project has three components:

- Federal/State of Washington requirements
- Documentation of testing conducted under the RD&D permit
- Additional project administrative requirements related to project health and safety activities.

9.2 OPERATING RECORD (FEDERAL AND STATE REQUIREMENTS)

ORP will maintain a written operating record of activities conducted under the RD&D project. The record will be maintained until closure of the facility at the end of the RD&D project.

The record will include the following:

- A description and quantity of dangerous waste received and treated at the facility (WAC 173-303-380(1)(a))
- The location of each dangerous waste within the facility and the quantity at each location (WAC 173-303-380(1)(b))
- Records and results of analyses required by WAC 173-303-300 (WAC 173-303-380(1)(c))
- Summary reports and details of all incidents that require implementing the RD&D Contingency Plan (Section 10.0) (WAC 173-303-380(1)(d))
- Records and results of inspections conducted under the RD&D Inspection Plan (Section 7.0) (WAC 173-303-380(1)(e))
- Monitoring, testing, or analytical data, and corrective action where required by WAC 173-303-630 through 173-303-646 (WAC 173-303-380(1)(e)).

9.3 RD&D PROJECT REQUIREMENTS

9.3.1 Reporting of Project Progress and Results

Upon completion of testing and data analysis for each test campaign, a summary report will be prepared covering the conduct of the campaign, and will include:

- Statement of campaign scope and objectives
- Description of test conduct including range of treatment parameters investigated
- Review of operational and data acquisition problems and resolutions
- Summary test results and relevant documentation needed to verify compliance with environmental standards.

Test campaign reports will be made available for Ecology use and review at the Test and Demonstration Facility.

9.3.2 RD&D Project Final Report

Upon completion of the RD&D project, a final report will be prepared and submitted to Ecology. Report content and discussion will provide sufficient information and data to allow evaluation against project objectives.

The final report will present process descriptions, data, and results, along with reviews of treatment campaigns, unless other formats provide more insight into system performance. Conclusions will be stated concerning the validity of given operating conditions, reasonable ranges of system parameter adjustments, results of waste processing and analysis, and other information as appropriate.

9.4 HEALTH AND SAFETY CONSIDERATIONS

Records of all training, physical examinations, employee injury and accident reports, and other records as appropriate, will be maintained in accordance with Federal and State requirements.

PERMIT ATTACHMENT HH

(RESERVED)

Permit Number: WA 7890008967

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PERMIT ATTACHMENT II

Inspection Plan – Section 7 of the Permit Application

Permit Number: WA 7890008967

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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CONTENTS

FIGURES

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7.0 INSPECTION PLAN

7.1 PROJECT REQUIREMENTS

Inspections are intended to ensure that situations do not exist that might cause or lead to the release of dangerous or mixed waste to the environment or that might pose a threat to human health and the environment. Abnormal conditions identified by inspections must be corrected on a schedule that helps prevent hazards to personnel, the public, and the environment. ORP will ensure that inspections conducted at the Test and Demonstration Facility activity area meet applicable regulatory requirements including WAC 173-303-320(2), WAC 173-303-395(1)(d), WAC 173-303-630(6), and WAC 173-303-640(6).

7.2 SCHEDULED INSPECTIONS

7.2.1 General

In addition to the campaign startup inspections, overall routine inspections and maintenance requirements have been defined for the DBVS. These scheduled inspections are described in the following sections. The content and frequency of any additional scheduled inspections will be based on the operating and maintenance instructions specified by the equipment manufacturers.

7.2.2 Startup Inspections

Startup inspections will be performed in compliance with the equipment manufacturers' instructions.

7.2.3 Daily Inspections

Daily inspections will include the following:

- Areas subject to spills
- Accessible tank systems, including tanks, pumps, piping, valves, flanges, and other ancillary equipment
- The accessible aboveground portions of waste transfer piping and waste vacuum transfer lines
- Monitoring data from any leak detection equipment
- The construction materials and the area immediately surrounding the externally accessible portion of tank systems, including secondary containment systems.

7.2.4 Weekly Inspections

Weekly inspections will consist of the following:

- Inspection of container storage areas for leaking containers and for deterioration of containers and containment system
- Confirmation that containers are segregated by material compatibility

- Confirmation that adequate and unimpeded aisle space is provided (i.e., thirty inches aisle space as a minimum)
- Confirmation that area security controls including placards and signage are in place, intact, and functional
- Confirmation that containers are properly stacked.

7.2.5 Additional Inspections

Additional inspections will include, but not be limited to, safety equipment and emergency response supplies:

- Fire extinguishers
- Eye wash and emergency shower
- First aid supplies
- Personnel protective equipment
- Spill control supplies
- Spill control equipment
- Each ICV® container (design/operation specifications).

7.3 DOCUMENTATION

A report of each inspection is to be recorded by the facility operator. The reports will be maintained in a master inspection log maintained at the facility. Frequency of inspection, and format and content of the inspection report forms and inspection log will be in compliance with WAC 173-303-320, WAC 173-303-630(6), and WAC 173-303-640(6).

Where observations indicate a finding of deficiency, the inspector must specifically describe the situation on the inspection form and determine whether the condition of the item is "acceptable" for continued use pending repair or replacement, or is "unacceptable" and must be repaired or replaced prior to further use. If repair or replacement of the item or area is required, the Test and Demonstration Facility manager must be notified and the repair or replacement initiated immediately.

Once the situation is corrected, documentation of the repair effort must be prepared and filed per Section 9.0. The existing "Problem Evaluation Request" (PER) form and documentation procedures will be used to formally identify, track, and close deficiencies.

7.4 CORRECTIVE ACTION

The inspection checklists for each activity or area contain a signature and date block for review and approval of corrective actions (if any) by the operator. Discrepancies and non-compliant conditions noted on the checklist must be corrected at the first opportunity as indicated in the PER procedures. Typical inspection checklists for containerized waste storage areas and waste tank systems are provided in Figures 7-1 and 7-2, respectively.

CH2M HILL is responsible for committing staff and resources to correct any noted conditions. Once a condition is corrected, the inspector is required to sign the inspection checklist, noting the area has been reinspected and is in compliance with permit requirements. The inspector must also provide a brief description of those actions in the space provided. A corrective action log will be maintained by the facility.

7.5 RECORDKEEPING

An inspection log containing all completed inspection reports and supporting documentation for corrective actions taken must be maintained for each calendar year in accordance with WAC 173-303-380. The inspection log will provide a case history of all items and areas inspected. A current copy of the corrective action log must be kept with the inspection log.

1 **Figure 7-1. Typical Inspection Checklist for Waste Storage Area**

AREA: ______________________________

INSPECTOR: ______________ DATE: ______________

1. Are items properly labeled?

   YES ☐ NO ☐ COMMENT ☐

2. Is adequate aisle space and item segregation being maintained?

   YES ☐ NO ☐ COMMENT ☐

3. Are only authorized items stored in the area?

   YES ☐ NO ☐ COMMENT ☐

4. Are items elevated on pallets or racks to prevent contact with wet surfaces or runoff?

   YES ☐ NO ☐ COMMENT ☐

5. Are item exteriors kept clean (i.e., drips and spills cleaned up)?

   YES ☐ NO ☐ COMMENT ☐

6. Are suitable and adequate spill control supplies and equipment available in the area?

   YES ☐ NO ☐ COMMENT ☐

7. Is area drainage in good repair?

   YES ☐ NO ☐ COMMENT ☐

Comments: ______________________________

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Signature of Inspector: ______________________________

Signature of Reviewer: ______________________________

Date of Review: ______________________________

Description of Corrective Actions: ______________________________

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Corrective Action Approval: ______________________________

Date of Approval: ______________________________

Corrective Actions Completed: ______________________________
(Signature and Date)

Figure 7-2. Typical Inspection Checklist for Waste Tank Storage Area

AREA: ____________________

INSPECTOR: ____________________ DATE: __________

NOTE TANK DESIGNATIONS AND CONTENTS ON ATTACHED TABLE.

1. Are tank shell, valves, gauges, etc. in good condition and free of leaks?

   YES ☐ NO ☐ COMMENT ☐

2. If so equipped, is tank insulation in good repair?

   YES ☐ NO ☐ COMMENT ☐

3. Is tank containment in good condition?

   YES ☐ NO ☐ COMMENT ☐

4. If so equipped, are tank containment drain valve(s) secured in the closed position?

   YES ☐ NO ☐ COMMENT ☐

5. Is tank containment free of accumulated liquids, including precipitation?

   YES ☐ NO ☐ COMMENT ☐

6. Have spills from liquid transfer operations been cleaned up?

   YES ☐ NO ☐ COMMENT ☐

7. Are suitable and adequate spill control supplies and equipment available in the area?

   YES ☐ NO ☐ COMMENT ☐

8. Is area drainage in good repair?

   YES ☐ NO ☐ COMMENT ☐

9. Has local sedimentation or erosion occurred around tank or containment since last inspection?

   YES ☐ NO ☐ COMMENT ☐

Figure 7-2. Typical Inspection Checklist for Waste Tank Storage Area (Cont.)

Comments: ____

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Signature of Inspector: ______________________________

Signature of Reviewer: ______________________________

Date of Review: ______________________________

Description of Corrective Actions: ______________________________

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Corrective Action Approval: ______________________________

Date of Approval: ______________________________

Corrective Action Completed: ______________________________

Figure 7-2. Typical Inspection Checklist for Waste Tank Storage Area (Cont.)

STORAGE TANK SUMMARY

TANK NAME/NUMBER	TANK CONTENTS

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PERMIT ATTACHMENT JJ

Container Management – Following Sections and Figures of the Permit Application

Section 2.3.2	Waste Retrieval and Storage
Section 2.4	Treated Waste Packaging
Section 4.2.9	Vitrification Container Preparation
Section 4.2.10	In-Container Vitrification
Section 4.2.11	Post-Vitrification Activities
Section 7.2.4	Weekly Inspections
Section 7.4	Corrective Action
Figure 2-2	Test and Demonstration Facility Site and Equipment Layout – Page 1
Figure 7-1	Typical Inspection Checklist for Waste Storage Area
Figure B-1	Phase 1 Process Flow Diagram – Page 1
Figure B-4	Phase 2 Process Flow Diagram – Page 1

Permit Number: WA 7890008967

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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Section 2.3.2
Waste Retrieval and Storage

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2.3.2 Waste Retrieval and Storage

The retrieval detail for Tank 241-S-109 is presented in RPP-18812, *Tank S-109 Partial Retrieval Functions and Requirements*, and has been submitted to Ecology for approval of the retrieval process.

There will be a difference in the retrieval of waste from Tank 241-S-109 and its transfer to the DBVS between Phases 1 and 2 of the program. During Phase 1, waste from Tank S-109 will be routed through a solids/liquid hydroclone separator and sensing instruments to a staging tank that will hold 3,780 L (1,000 gal) of material (Figure 2-4). The sensing instruments will provide process control or waste characterization information. Staging tank discharge will be pumped to either a DBVS waste receipt tank or, if not suitable for processing in the DBVS, to the DST system.

During Phase 2 the waste will be transferred directly to the waste receipt tanks. The transfer route will go through the solids/liquid hydroclone separator and sensing instrumentation, but bypass the 3,780 L (1,000 gal) waste staging tank (Figure 2-4).

The Test and Demonstration Facility will accept tank waste into waste receipt tanks with capacities shown in Table 2-1.

Table Error! No text of specified style in document.**-1. Waste Receipt Tank Capacity**

Phase	Number of Tanks	Capacity	Total Capacity
1	1	3,780 L (1,000 gal)	3,780 L (1,000 gal)
2	4	68,140 L (18,000 gal)	272,160 L (72,000 gal)

All waste storage tanks and containers including the waste staging tank and waste receipt tanks will be properly and legibly marked in accordance with the requirements of WAC 173-303-395(6). Containers will be managed in accordance with the requirements of WAC 173-303-630. All waste tank systems will comply with the design, installation, and operating requirements of WAC 173-303-640, as applicable. Tank system materials of construction will be selected with appropriate consideration for the corrosion potential of the materials stored and process conditions.

Secondary containment will be provided for all tanks in the form of double-walled tankage or containment structures with sumps. Containment provisions will be designed and constructed for compliance with WAC 173-303-640(4).

During Phase 1, the waste staging tank and waste receipt tank will be double shell tanks or placed in containment structures with sumps (Figures 2-2 and 2-3). For Phase 2, the waste staging tank will be bypassed but will either remain in its structure or be removed and decontaminated in compliance with the Test and Demonstration Facility closure plan (Section 11.0).

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Section 2.4
Treated Waste Packaging

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2.4 TREATED WASTE PACKAGING

Containers of treated waste resulting from the bulk vitrification process will be placed in a dedicated temporary storage area at the Test and Demonstration Facility site (Figure 2-2) during the RD&D permit duration. By generating immobilized treated waste directly in the container, the treatment container also serves as the final disposal container. The storage area will be designed to hold all containers of treated waste generated during the project. The storage area will meet the provisions of WAC 173-303-630(7)(c)(i) and (ii) which are applicable for storage areas that store containers holding only wastes that do not contain free liquids (i.e., the bulk vitrification waste containers):

(i) *The storage area is sloped or otherwise designed and operated to drain and remove liquid resulting from precipitation; or*

(ii) *The containers are elevated or are otherwise protected from contact with accumulated liquids.*

All containers, handling procedures, and handling equipment will meet the waste acceptance criteria of the accepting disposal facility. Final disposal of treated waste will be at a permitted Hanford Site facility.

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Section 4.2.9
Vitrification Container Preparation

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4.2.9 Vitrification Container Preparation

The typical waste container for the vitrification process is expected to be a steel box approximately 3.0 m (10 ft) high, 2.4 m (8 ft) wide, and 7.3 m (24 ft) long. Containers will comply with the waste acceptance criteria for the receiving TSD unit (a permitted Hanford Site facility). Prior to waste distribution, the container will be lined with insulating board, sand, and a layer of castable refractory. The castable refractory (Appendix F) will face the waste material. A layer of melt-initiating graphite and soil will be placed over the castable refractory in the bottom of the container. The container will contain a port(s) for sampling the vitrified waste to obtain samples for analyses listed in Section 6.0.

A steel lid with attached electrodes will be sealed onto the container prior to waste deposition using bolted flanges and a refractory gasket. The lid contains several ports for waste material addition, electrode connections, venting, sampling, and introduction of post-vitrification materials. All connections will be mechanically sealed to the container lid. In addition, waste transfer connections will be equipped with shutoff valves to prevent spillage of material as the chute is attached to and removed from the port. To minimize potential contamination to workers and the environment, the connection points will be equipped with secondary containment and spilled material recovery equipment during material transfer, melting, and cooldown. Containment will consist of a ancillary waste transfer enclosure (AWTE) that seals to the container lid before waste is added to the container. The AWTE provides containment while the waste and soil addition connections are made and during the melt process. The operator is able to access the waste and soil addition connections through glove ports in the AWTE. Once the melt is complete and the container is cool enough to add clean soil on the top, the AWTE will be removed to allow the container to move to the temporary storage area. The waste container filling/vitrification station will be equipped with shielding, as required.

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Section 4.2.10
In-Container Vitrification

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4.2.10 In-Container Vitrification

The waste mixture, including simulants and glass formers, from the mixer/dryer will be placed into the vitrification container through ports in the sealed container lid. Electric power will be applied to the electrodes, vitrifying the container contents via resistive heating to produce ILAW. The ILAW is the final RCRA waste form for disposal. Ambient air, filtered through a HEPA filter, is injected to assist in establishing and maintaining airflow through the container to the offgas treatment system, cool the vitrification offgases, and provide thermal protection for HEPA filters in the offgas treatment system. Vitrification offgases are vented under induced draft to the offgas treatment system. During the vitrification process, the depth of material will typically decrease due to consolidation in melting.

Both "bottom-up" and "top-down" melting may be conducted during testing to determine the most effective method of waste treatment. The current plans focus on the bottom-up melt procedure; however, there may be a need to perform top-down melting at some time during the testing process. Top-down melting is conducted by applying power to the electrodes only after all waste materials and process additives have been placed in the container. Bottom-up melting begins melting with a shallow layer of material in the container and continues as more material is added until the desired depth of melt is obtained.

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Section 4.2.11
Post-Vitrification Activities

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4.2.11 Post-Vitrification Activities

After vitrification has been completed, the container connection to the offgas treatment system will be maintained. Clean fill materials will be added to fill cavities around the electrodes and cover the top of the vitrified mass to minimize headspace in the container, creating a container that is at least 90% full.

Sampling of the vitrified waste, radiation surveying, and external decontamination (container wipedown, vacuuming of dust, etc.), as necessary, can be conducted any time after initial cooling has been completed. Sampling of the melt will be conducted by a coring process through a port in the side of the container. The method of sealing the sampling port during and after sampling has not been finalized. However, the port will be sealed in such a manner that the container remains in compliance with the RD&D Permit and the permitted storage/disposal facility waste acceptance criteria. Sampling protocol and methodology is addressed in Section 6.0. The data obtained will be used for waste form qualification, risk assessment, and performance assessment.

Temporary storage for up to 50 treated waste containers will be located at the north end of the Test and Demonstration Facility (Figure 2-2). At the completion of RD&D activities, the containers will be transported to the IDF or to another permitted Hanford Site storage/disposal facility.

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Section 7.2.4
Weekly Inspections

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7.2.4 Weekly Inspections

Weekly inspections will consist of the following:

- Inspection of container storage areas for leaking containers and for deterioration of containers and containment system
- Confirmation that containers are segregated by material compatibility
- Confirmation that adequate and unimpeded aisle space is provided (i.e., thirty inches aisle space as a minimum)
- Confirmation that area security controls including placards and signage are in place, intact, and functional
- Confirmation that containers are properly stacked.

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Section 7.4
Corrective Action

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7.4 CORRECTIVE ACTION

The inspection checklists for each activity or area contain a signature and date block for review and approval of corrective actions (if any) by the operator. Discrepancies and non-compliant conditions noted on the checklist must be corrected at the first opportunity as indicated in the PER procedures. Typical inspection checklists for containerized waste storage areas and waste tank systems are provided in Figures 7-1 and 7-2, respectively.

CH2M HILL is responsible for committing staff and resources to correct any noted conditions. Once a condition is corrected, the inspector is required to sign the inspection checklist, noting the area has been reinspected and is in compliance with permit requirements. The inspector must also provide a brief description of those actions in the space provided. A corrective action log will be maintained by the facility.

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Figure 2-2
Test and Demonstration Facility Site and Equipment Layout – Page 1

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Figure 7-1
Typical Inspection Checklist for Waste Storage Area

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Figure Error! No text of specified style in document.**-1. Typical Inspection Checklist for Waste Storage Area**

AREA: ______________________________
INSPECTOR: ______________ DATE: ______________

1. Are items properly labeled?

   YES ☐ NO ☐ COMMENT ☐

2. Is adequate aisle space and item segregation being maintained?

   YES ☐ NO ☐ COMMENT ☐

3. Are only authorized items stored in the area?

   YES ☐ NO ☐ COMMENT ☐

4. Are items elevated on pallets or racks to prevent contact with wet surfaces or runoff?

   YES ☐ NO ☐ COMMENT ☐

5. Are item exteriors kept clean (i.e., drips and spills cleaned up)?

   YES ☐ NO ☐ COMMENT ☐

6. Are suitable and adequate spill control supplies and equipment available in the area?

   YES ☐ NO ☐ COMMENT ☐

7. Is area drainage in good repair?

   YES ☐ NO ☐ COMMENT ☐

Comments: ______________________________

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Signature of Inspector: ______________________________

Signature of Reviewer: ______________________________

Date of Review: ______________________________

Description of Corrective Actions: ______________________________

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Corrective Action Approval: ______________________________

Date of Approval: ______________________________

Corrective Actions Completed: ______________________________
(Signature and Date)

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Figure B-1
Phase 1 Process Flow Diagram – Page 1

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PERMIT ATTACHMENT KK

Tank Management – Following Sections, Figures, and Appendices of the Permit Application

Section 2.2.1	Bulk Vitrification System Components
Section 2.3.2	Waste Retrieval and Storage
Section 2.3.3	Waste Transfer
Section 2.6	Secondary Wastes
Section 4.0	Bulk Vitrification Test and Demonstration Facility
Section 7.2.3	Daily Inspections
Section 7.4	Corrective Action
Section 7.5	Recordkeeping
Figure 2-2	Test and Demonstration Facility Site and Equipment Layout – Page 1
Figure 2-4	Waste Retrieval System for Phase 1 and Phase 2
Figure 7-2	Typical Inspection Checklist for Waste Tank Storage Area
Appendix B	Process Flow Diagrams

Permit Number: WA 7890008967

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Section 2.2.1
Bulk Vitrification System Components

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2.2.1 Bulk Vitrification System Components

The DBVS consists of trailer-mounted and skid-mounted equipment suitable for field installation, operation, and removal at the completion of the project. The system includes the major components, systems, and areas listed below, which are described in detail in Section 4.0.

The general arrangement of the following components for Phase 1 and for Phase 2 (Figures 2-2 and 2-3) includes:

- Waste retrieval system
- Waste staging tank and pumps
- Waste receipt tanks and pumps
- Process additive storage/handling
- Waste feed preparation (mixer/dryer)
- Vitrification container preparation system
- In-container vitrification (ICV®) system
- Electrical equipment
- Offgas treatment system
- Control and data acquisition system
- ILAW storage

Secondary waste storage and handling (containers or tanks).

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Section 2.3.2
Waste Retrieval and Storage

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2.3.2 Waste Retrieval and Storage

The retrieval detail for Tank 241-S-109 is presented in RPP-18812, *Tank S-109 Partial Retrieval Functions and Requirements*, and has been submitted to Ecology for approval of the retrieval process.

There will be a difference in the retrieval of waste from Tank 241-S-109 and its transfer to the DBVS between Phases 1 and 2 of the program. During Phase 1, waste from Tank S-109 will be routed through a solids/liquid hydroclone separator and sensing instruments to a staging tank that will hold 3,780 L (1,000 gal) of material (Figure 2-4). The sensing instruments will provide process control or waste characterization information. Staging tank discharge will be pumped to either a DBVS waste receipt tank or, if not suitable for processing in the DBVS, to the DST system.

During Phase 2 the waste will be transferred directly to the waste receipt tanks. The transfer route will go through the solids/liquid hydroclone separator and sensing instrumentation, but bypass the 3,780 L (1,000 gal) waste staging tank (Figure 2-4).

The Test and Demonstration Facility will accept tank waste into waste receipt tanks with capacities shown in Table 2-1.

Table 4-1. Waste Receipt Tank Capacity

Phase	Number of Tanks	Capacity	Total Capacity
1	1	3,780 L (1,000 gal)	3,780 L (1,000 gal)
2	4	68,140 L (18,000 gal)	272,160 L (72,000 gal)

All waste storage tanks and containers including the waste staging tank and waste receipt tanks will be properly and legibly marked in accordance with the requirements of WAC 173-303-395(6). Containers will be managed in accordance with the requirements of WAC 173-303-630. All waste tank systems will comply with the design, installation, and operating requirements of WAC 173-303-640, as applicable. Tank system materials of construction will be selected with appropriate consideration for the corrosion potential of the materials stored and process conditions.

Secondary containment will be provided for all tanks in the form of double-walled tankage or containment structures with sumps. Containment provisions will be designed and constructed for compliance with WAC 173-303-640(4).

During Phase 1, the waste staging tank and waste receipt tank will be double shell tanks or placed in containment structures with sumps (Figures 2-2 and 2-3). For Phase 2, the waste staging tank will be bypassed but will either remain in its structure or be removed and decontaminated in compliance with the Test and Demonstration Facility closure plan (Section 11.0).

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Section 2.3.3
Waste Transfer

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2.3.3 Waste Transfer

Waste transfer will be in the form of waterborne salt solution. Waste left in a waste receipt tank at the end of a campaign may be transferred to another tank and mixed with incoming waste for processing. A waste transfer line water flush may be made after each batch transfer of waste feed, as needed. Waste transfer will occur only after verification that all systems are ready for the transfer/receipt of waste. The vitrification station will be located beneath the dried waste hoppers for gravity feed of waste to the container. The mixer/dryer, vitrification, cooldown, and topoff/survey stations will be provided with radiation shielding and spill containment curbs.

Secondary containment will be provided for liquid waste transfer operations in the form of hose-in-hose or pipe-in-pipe transfer lines. Dried waste transfer from the mixer/dryer to the hopper will have secondary containment. Dried waste transfer from the hopper to the container will be conducted inside a removable hood sealed to the container top. Cleanup of spills within the hood will be performed using a containment system.

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Section 2.6
Secondary Wastes

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2.6 SECONDARY WASTES

A variety of secondary wastes may be generated during the planned project. This section covers general requirements for management of expected secondary wastes. Details are provided in Section 4.0.

Secondary waste streams such as liquid effluent will be disposed of in the Liquid Effluent Retention Facility, the Effluent Treatment Facility (ETF), or the 200 Area Treated Effluent Disposal Facility, as appropriate. Disposition of solid waste streams will be managed in accordance with HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, and the waste acceptance criteria of the receiving facility, as necessary. Disposition of secondary liquid effluent waste streams will be managed in accordance with HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*, and the acceptance criteria of the receiving facility, as necessary.

Dedicated tanks will be provided for onsite liquid waste storage pending sampling and transfer to a treatment facility. It is anticipated that up to ten 68,140L (18,000 gal) tanks may be used. The actual capacity and number of tanks will be determined during the DBVS project. Tank systems will comply with the applicable portions of WAC 173-303-640.

Storage tank capacity requirements are based on the following assumptions:

- Dryer condensate = 3.40 gpm x 60 min/hr x 7.9 hr/dryer batch x 8 dryer batches ≈ 12,900 gal
- Quench blowdown = 2.39 gpm x 60 min/hr x 168 hr/ICV batch ≈ 24,100 gal
- Tri-Mer Scrubber blowdown[1] = 4.29 gpm x 60 min/hr x 200 hr/ICV batch ≈ 51,500 gal
- Total flow to ETF per ICV container ≈ 88,500 gal per container.

Offgas treatment system equipment designs will comply with the applicable requirements of WAC 173-400, 173-401, 173-460, WAC 246-247, and ASME AG-1, *Code on Nuclear Air and Gas Treatment*. The design of the gaseous and particulate effluent monitoring system will comply with ANSI/HPS N13.1, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities.* The process equipment will interface with systems that transport secondary waste to appropriate locations.

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Section 4.0
Bulk Vitrification Test and Demonstration Facility

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CONTENTS

TABLES

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4.0 BULK VITRIFICATION TEST AND DEMONSTRATION FACILITY

The DBVS treatment equipment will be installed and operated under two phases as described in Section 1.7.1. The scope and conduct of the phased operation is described in detail in Section 5.0. Unless otherwise stated, the configuration and operation described are consistent with Phase 2 activities.

4.1 TECHNOLOGY-SPECIFIC GOALS AND OBJECTIVES

The primary purpose of testing the DBVS is to fully demonstrate the bulk vitrification process on Hanford tank waste while meeting the project objectives listed in Section 1.5 and assuring protection of human health and the environment. In terms of technology-specific assessment goals and objectives, the DBVS must also demonstrate its ability to perform effectively while:

- Preventing the release of contaminants into the environment during processing
- Preventing exposure of plant operating personnel to hazardous process streams
- Minimizing the production of secondary waste streams.

4.2 PROCESS AND EQUIPMENT DESCRIPTION

The primary technology to be used for the DBVS is an ICV® process. Process flow diagrams for both phases of the RD&D project are provided in Appendix B. Process operation is essentially the same for both phases.

The salt solution is retrieved from Tank 241-S-109, subjected to pretreatment as required (Section 1.7.3), and transferred to the waste receipt tank(s). The waste is mixed with glass formers in a mixer/dryer unit and dried prior to being transferred to the ICV® containers (Section 4.2.8). Transfer of the dried waste mixture is accomplished through ports in the container lid.

The ICV® container is prepared before the waste mixture is transferred to the container. Preparation of the ICV® container includes lining the container with refractory materials that will be selected based on successful testing/operation at the range of process temperatures expected. Refractory material will include cast material and sand as noted in Appendix F. The electrodes are then mounted on the container lid. The lid is lowered onto the container with a refractory gasket sealing the lid to the container, bolted in place, and the offgas ductwork is connected. Once the ICV® container is prepared, the waste mixture is added from the mixer/dryer in batches.

The waste mixture is vitrified by resistive heating caused by electrical resistance of soil and waste. The heating cycle lasts for approximately 130 hours.[1] Vitrification emissions are routed to an offgas treatment system (Section 4.2.12).

After completion of the vitrification process (Section 4.2.11), fill material (e.g., sand) will be added to fill the void container volume and provide a sufficient fill fraction (>90% by volume)

[1] Total container processing time, including waste mixing/drying, container fill, connection hookup, etc., is approximately 168 hours or one operating week.

for container landfill disposal. The vitrified waste will undergo cooling, sampling, and external decontamination as required. Final cooling may occur at designated cooling stations along the process line or at an interim storage location on the Test and Demonstration Facility site. Core samples may be removed through ports in the container for analysis and testing. Test results will be used to support waste form qualification, risk assessment, and performance assessment. A composite core sample (e.g., vitrified material, sand, and refractory material) will be evaluated for compliance with LDR, as noted in Section 6.0.

4.2.1 System Capacity

The feed rate to the mixer/dryer may be varied as one of the parameters being evaluated through this demonstration project. During Phase 1, up to three test runs will be performed to conduct systems verification and initial waste treatment using approximately 1,135 L (300 gal) of tank waste per container. The amount of waste introduced into each container will be varied during Phase 2 in order to investigate the effect of waste loading on processing time, electric power usage, etc. Over the entire series of test campaigns in Phase 2, the average waste material volume used per test will be approximately 58,080 L (15,345 gal) of a 5 M salt solution. However, individual campaigns may be conducted using up to 76,540 L (20,220 gal) of a 5 M salt solution in a container load.

4.2.2 Waste Retrieval System

As noted in Section 2.3.2, the WRS will provide waste feed from Tank 241-S-109 to the DBVS in two distinct phases. During Phase 1, a limited quantity of waste is planned to be provided to the DBVS. During this phase, the quantity of waste will be limited within the facility such that the facility will be classified as below a Hazard Category-3 radiological facility as defined in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. During Phase 2, the quantity of waste to the facility will be increased such that the facility will be classified as a Hazard Category-2 facility. The qualitative definition of a Hazard Category-2 facility is that the hazard analysis shows the potential for only significant localized consequences.

During Phase 1, waste transfer will occur through a Waste Staging Tank Skid, which will include the following safety features:

- Leak detection - The skid will perform a secondary containment role. If there are any leaks in the staging tank, piping, fittings, etc, within this skid, the skid will contain the leak. A leak detection sensor located on the floor of the skid will detect the leak and activate an alarm system. Any material leaked into the skid will be routed back to either Tank 241-S-109 or to the DST system.
- Waste staging tank ventilation - The waste staging tank and the containment structure will be "passively vented" to atmosphere through high-efficiency particulate air (HEPA) filter(s).
- Tank overflow protection - A tank overflow detector will be provided, with remote indication that the tank level has been exceeded. An overflow line will also be provided to direct the overflowing waste to the floor of the skid. As mentioned above, if this

"faulted condition" occurs, the leak detection system will identify the situation and waste transfer operations can be stopped.

- Sampling port - A sampling port will be provided on the top of the waste staging tank to allow waste samples to be withdrawn from the tank for analysis.
- "Bad batch disposal"- If the waste staging tank's contents are found not to be within the acceptable specification for acceptance to the DBVS, the waste batch will be sent to the DST system. The waste retrieval pump can be valved to send out-of-specification waste back into the transfer line to Tank 241-S-109, and via the 3-way valve in the pump pit, to the SY Farm Waste Retrieval Receiver Tank.

4.2.2.1 Phase 1 Activities. During Phase 1, waste from Tank 241-S-109 will be sent to a double-wall staging tank that will hold 3,780 L (1,000 gal) of waste. A retrieval pump will be used to remove waste from Tank 241-S-109 and transfer it to the staging tank. It is anticipated that the waste transfer pump will be a jet pumping system similar to the ones used for saltwell pumping on the Hanford Site and that the transfer rate will be between 19 L/min and 28 L/min (5 - 10 gpm). The pump, solids/liquid separator, and the sensing systems noted in the following paragraphs will be located in a pump pit containment structure adjacent to Tank 241-S-109.

The pump suction will be screened to prevent entrainment of solid particles in the pump inlet stream. The pump discharge will be routed through a solids/liquid hydroclone separator capable of reducing the waste stream solids content to 3% or less. Hydroclone separator devices use a tangential inflow to a vertical cylindrical vessel creating a spiral flow path for the liquid, using centrifugal forces to remove solid particles from the flow stream and move them outwards to the vessel walls. The dispersed particles move downward under gravity into a cone-shaped collection chamber, while the purified liquid moves upward to the center of the unit to a top mounted outlet. The unit is usually equipped with an airlock on the collection chamber to maintain pressure drop across the unit without drawing in ambient air. This filtration system will have the capability to be flushed back to Tank 241-S-109 and/or be replaced, if the differential pressure across it exceeds the allowable value.

From the solids/liquid hydroclone separator, the filtered waste will be monitored by sensing instruments to provide process control over waste transfer or waste characteristic information. Waste transfer process control will be based on the results of waste sampling and analysis. The proposed instruments to be included in this system are:

- A flow meter capable of indicating the specific gravity and flow rate of the waste.
- A chemical speciation probe.[1] This is an experimental device being developed by Pacific Northwest National Laboratory that will utilize Raman technology to provide scientific information on the chemical speciation of the waste.
- A conductivity probe. This device will provide information on the waste conductivity. The conductivity probe is planned to be a process control device.
- An optional gamma radiation monitor.

[1] Due to the experimental nature of this probe, it will not be used for regulatory compliance purposes.

A three-way valve will direct waste to either the waste staging tank or, if the waste does not meet the waste acceptance criteria noted in Section 6.0, to the DST system for storage and eventual disposal. The waste transfer piping from pump pit to either of these locations will be through a hose-in-hose-transfer line (HIHTL) and will be equipped with an optional on-line radiation monitoring system which will continuously measure the quantity of Cs-137 being transferred through the HIHTL.

Initial waste retrieval during Phase 1 will direct waste to the DST system. CH2M HILL Process Engineering personnel will monitor the transfer data, while waste is being sent to the SY tank farm and determine when to route the waste stream to the waste staging tank. When the waste characteristics are deemed acceptable for processing, the three-way valve in the pump pit will be positioned to send waste to the waste staging tank.

The waste staging tank will have only one inlet/outlet combination. While transferring waste from Tank 241-S-109 to the waste staging tank, the tank will be connected to Tank 241-S-109 via a HIHTL. With this design, the system is physically disconnected from the DBVS facility when the waste staging tank is being filled with waste. Once the waste staging tank is filled the waste batch is characterized. When it has been verified that the waste meets the DBVS waste acceptance criteria the HIHTL connecting the waste staging tank and Tank 241-S-109 will be disconnected. The HIHTL from the DBVS facility will then be connected to the same connector on the waste staging tank. The contents of the waste staging tank will then be pumped to the DBVS receiver tank, via this HIHTL that will exit the farm, go under Cooper Avenue, and mate up with a receiver skid at the DBVS facility.

If analysis of tank contents determines that the waste batch is not acceptable for processing, it will be routed to the DST system.

4.2.2.2 Phase 2 Activities. During Phase 2, the "segmentation" concept from Phase 1 will no longer be required since the DBVS Facility will be a Hazard Category-2 facility. Waste transfer rates will be increased to an anticipated 76 L/min (20 gpm). The waste tank can, and will be, directly connected to the DBVS facility. The transfer route from Tank 241-S-109 to DBVS will bypass the waste staging tank skid. The solids/liquid separator and the sensing instrumentation will be retained but the solids/liquid separator capacity will be increased to accommodate the increased waste flow rate.

4.2.3 Waste Receipt and Storage

The WRS transfers waste into waste receipt tank(s) for process feed, storage, and sampling. The waste received will be stored in tanks as noted in Table 2-1. Tank capacities are based on anticipated waste processing rates described in Sections 1.7.5 and 4.2.1. All waste storage tanks will be double-wall construction with HIHTL and leak detection provisions. Waste tanks will be vented through the offgas treatment system (Sections 4.2.15 and 4.2.16).

A single 3,780-L (1,000-gal) waste receipt tank will be used during Phase 1 because the total amount of waste treated in the initial campaigns will be minimal. The use of a small tank will limit the amount of waste stored during Phase 1 to an amount below Hazard Category-3 requirements.

At the completion of Phase 1, the 3,780-L (1,000-gal) storage tank may be retained and used for storage of process additives such as simulated waste materials (simulants) or spiking agents during Phase 2 if allowed after flushing and inspection to clean debris standards. Additional waste receipt tanks (Section 2.3.2 and Table 2-1) will be installed for Phase 2. The additional tanks will be installed so that one or more tanks can be used to provide waste feed for treatment while the other tanks are being filled and sampled as described in Section 6.0. In order to ensure that a consistent feed rate of waste material is delivered to the treatment system, each waste receipt tank is sized so that its contents are sufficient to supply more than the anticipated waste demand rate to the DBVS.

4.2.4 Process Additives

The DBVS will use soil, waste simulants, glass additives, offgas treatment chemicals, and other materials as process additives. Table 4-1 contains a summary of these materials, their storage methods, and uses. Soil will be used to form the matrix for the vitrification process and to add an additional layer of clean material on the vitrified mass in the container. Waste simulants will be used for running system verification tests prior to treatment of actual SST waste during Phase 1 and as "filler" to attain the required process material volume (waste plus simulant) for a given test campaign during testing in both phases. Waste simulants could include spiking agents for specific process performance testing purposes. The majority, estimated at seventy-five percent (75%) of simulants will be used in Phase 1. A 68,140-L (18,000-gal) double-wall tank will be used for simulant storage during this phase. This tank may be retained onsite for use as one of the waste storage tanks for Phase 2 operations or may be removed from the site at the completion of Phase 1. Process additives will be kept in dedicated storage areas segregated from regulated waste storage to minimize the possibility of contamination. Residual simulant material not used in Phase 2 will be analyzed for dangerous waste characteristics and, if designated as dangerous waste, will be managed in accordance with standard Hanford Site procedures.

Graphite will be placed in the vitrification container to help initiate the soil/waste melting process. Boron and zirconium will be used in small quantities (approximately 2,100 kg (4,630 lbs) and 3,000 kg (6,615 lbs) per container load, respectively) to optimize glass performance. Sand will be used as an insulator.

4.2.5 Dry Material Handling

Dry materials will be stored and either conveyed or transferred in bulk from various process staging areas to equipment within the DBVS. Depending on the material characteristics and the amounts used, the additives may be stored in tanks, containers, or in bulk (stockpiles) compliant with applicable regulatory requirements.

During Phase 1, the amount of soil required for the vitrification matrix will be limited. The soil will be stored in an onsite hopper for pneumatic conveying to the treatment system. A similar arrangement may be provided for Phase 2, or, depending on the soil usage rate, a stockpile may be maintained. The loading point for soil into the treatment system will be equipped with parallel storage silos and a baghouse air pollution control system. For stockpiles, engineering controls for dust suppression will be implemented.

Table 4-1. Process Additives Information

Additive	Form	Storage Method	Use	Point of Introduction
Soil	Solid	Hopper (Phase 1) Hopper stockpile (Phase 2)	Vitrification matrix, container topoff	Dryer
Sand	Solid	Stockpile	Insulating material	ICV container
Waste simulants	Solid/slurry	Tank	Waste material substitute; "spiking agents"	Waste receipt tank, dryer
Graphite	Solid	Containers	Vitrification aid	ICV container
Boron	Solid	Containers	Glass performance aid	Dryer
Zirconium	Solid	Containers	Glass performance aid	Dryer
Water	Liquid	Tank	Air pollution control	Quench unit, venturi scrubber, Tri-Mer scrubber
Ammonia	Gas	Pressurized tanker	Air pollution control	Selective catalytic reduction
Sulfuric acid	Liquid	Containers	Air pollution control	Tri-Mer scrubber
Sodium chlorate	Liquid	Containers	Air pollution control	Tri-Mer scrubber
Sodium sulfide	Liquid	Containers	Air pollution control	Tri-Mer scrubber
Sodium hydroxide	Liquid	Containers	Air pollution control	Tri-Mer scrubber

4.2.6 Liquid Material Handling

Liquid materials other than waste feed will be used during DBVS operations. These include water and scrubbing chemicals. Water will be provided directly from tanker trucks. Other liquid material used will either be stored in portable tanks or in containers (e.g., carboys, drums) depending on the material handling requirements and/or the quantity used. Materials stored in portable tanks will be replenished either by removal and replacement of the tank or refilling from a tanker. Liquid chemical storage areas will be provided with suitable spill containment provisions.

4.2.7 Gaseous Material Handling

As an integral part of a best available control technology program, ammonia will be used as an air pollution control aid for removal of oxides of nitrogen (NO_x). The gas will be supplied from a pressurized liquid ammonia tanker truck. Ammonia will be vaporized and injected into the offgas stream to ensure proper mixing and efficient NO_x scrubbing.

4.2.8 Waste Feed Preparation

Before the vitrification process begins, the waste material will be mixed with additives and dried to remove moisture in a batch-mode rotary mixer/dryer. The unit will be indirect-heated by steam from a diesel-fired onsite boiler. The boiler is a closed-loop system. Waste material will be pumped from waste receipt storage tanks. Appropriate additives will be conveyed or transferred to the unit. The dry material transfer systems will be equipped with weigh stations to control the amount of material being added to the dryer.

The mixer/dryer fill capacity for waste salt solution and process additives is 10,000 L (2,645 gal) at a nominal fill fraction of 45 to 50% (48.4% is the measured fraction from testing). The nominal drying cycle time is eight hours but may be as short as six hours for relatively dry incoming waste. During the mixing/drying cycle, the unit will be maintained under vacuum to promote the release of moisture from the material being processed at a reduced temperature. The moisture content of the material will be monitored by a load cell on the unit (noting the weight of moisture removed) and a moisture sensor in the exhaust duct. Discharge of dried material to the waste container will be vacuum transferred to feed hoppers and then gravity fed through an enclosed chute with shutoff valves. The amount of waste transferred will be determined from mixer/dryer load cell readings.

Mixer/dryer offgases will be treated to remove moisture before being routed to the main offgas treatment system for additional emission control.

4.2.9 Vitrification Container Preparation

The typical waste container for the vitrification process is expected to be a steel box approximately 3.0 m (10 ft) high, 2.4 m (8 ft) wide, and 7.3 m (24 ft) long. Containers will comply with the waste acceptance criteria for the receiving TSD unit (a permitted Hanford Site facility). Prior to waste distribution, the container will be lined with insulating board, sand, and a layer of castable refractory. The castable refractory (Appendix F) will face the waste material. A layer of melt-initiating graphite and soil will be placed over the castable refractory in the bottom of the container. The container will contain a port(s) for sampling the vitrified waste to obtain samples for analyses listed in Section 6.0.

A steel lid with attached electrodes will be sealed onto the container prior to waste deposition using bolted flanges and a refractory gasket. The lid contains several ports for waste material addition, electrode connections, venting, sampling, and introduction of post-vitrification materials. All connections will be mechanically sealed to the container lid. In addition, waste transfer connections will be equipped with shutoff valves to prevent spillage of material as the chute is attached to and removed from the port. To minimize potential contamination to workers and the environment, the connection points will be equipped with secondary containment and spilled material recovery equipment during material transfer, melting, and cooldown. Containment will consist of a ancillary waste transfer enclosure (AWTE) that seals to the container lid before waste is added to the container. The AWTE provides containment while the waste and soil addition connections are made and during the melt process. The operator is able to access the waste and soil addition connections through glove ports in the AWTE. Once the melt is complete and the container is cool enough to add clean soil on the top, the AWTE will be removed to allow the container to move to the temporary storage area. The waste container filling/vitrification station will be equipped with shielding, as required.

4.2.10 In-Container Vitrification

The waste mixture, including simulants and glass formers, from the mixer/dryer will be placed into the vitrification container through ports in the sealed container lid. Electric power will be applied to the electrodes, vitrifying the container contents via resistive heating to produce ILAW. The ILAW is the final RCRA waste form for disposal. Ambient air, filtered through a HEPA filter, is injected to assist in establishing and maintaining airflow through the container to the offgas treatment system, cool the vitrification offgases, and provide thermal protection for HEPA filters in the offgas treatment system. Vitrification offgases are vented under induced draft to the offgas treatment system. During the vitrification process, the depth of material will typically decrease due to consolidation in melting.

Both "bottom-up" and "top-down" melting may be conducted during testing to determine the most effective method of waste treatment. The current plans focus on the bottom-up melt procedure; however, there may be a need to perform top-down melting at some time during the testing process. Top-down melting is conducted by applying power to the electrodes only after all waste materials and process additives have been placed in the container. Bottom-up melting begins melting with a shallow layer of material in the container and continues as more material is added until the desired depth of melt is obtained.

4.2.11 Post-Vitrification Activities

After vitrification has been completed, the container connection to the offgas treatment system will be maintained. Clean fill materials will be added to fill cavities around the electrodes and cover the top of the vitrified mass to minimize headspace in the container, creating a container that is at least 90% full.

Sampling of the vitrified waste, radiation surveying, and external decontamination (container wipedown, vacuuming of dust, etc.), as necessary, can be conducted any time after initial cooling has been completed. Sampling of the melt will be conducted by a coring process through a port in the side of the container. The method of sealing the sampling port during and after sampling has not been finalized. However, the port will be sealed in such a manner that the container remains in compliance with the RD&D Permit and the permitted storage/disposal facility waste acceptance criteria. Sampling protocol and methodology is addressed in Section 6.0. The data obtained will be used for waste form qualification, risk assessment, and performance assessment.

Temporary storage for up to 50 treated waste containers will be located at the north end of the Test and Demonstration Facility (Figure 2-2). At the completion of RD&D activities, the containers will be transported to the IDF or to another permitted Hanford Site storage/disposal facility.

4.2.12 Offgas Treatment Requirements

Emissions may consist of either fugitive (i.e., bulk process additive loading and transfer) or point (i.e., stack) sources. Hazardous or radioactive emissions will not be released through fugitive sources, as those sources will be limited to nonhazardous and nonradioactive materials. Emission calculations for all sources will utilize appropriate emission factors, source classification codes, or other information. Fugitive emissions, which will consist only of nonhazardous materials such as dust from process additive transfers, will be addressed in the *New Source Review Notification of Construction for the Supplemental Treatment Test and Demonstration Facility* (Schepens 2004).

Point sources may emit both nonradioactive and radioactive emissions. These sources will be equipped with a continuous emissions monitoring system (CEMS) that will monitor and record emissions of radionuclides (beta and gamma detectors) and those criteria pollutants (e.g., particulate matter, carbon monoxide [CO], NO_x, and oxides of sulfur [SO_x]) for which regulatory monitoring requirements exist and are included in the final emission source permit(s)). The CEMS will be designed, installed, and operated in compliance with applicable portions of 40 CFR 60, Appendix B. The design of the gaseous and particulate effluent monitoring system will comply with ANSI/HPS N13.1, *Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities*. The CEMS data will be acquired in real time, but will be available for review in the form of periodically generated reports. Offgas treatment for DBVS operations will address the following issues:

- Particulate and gaseous emissions from waste receipt and storage
- Particulate emissions from process additive receipt, storage, and transfer (not including fugitive emissions from stockpiles)
- Particulate and gaseous emissions from mixer/dryer (dedicated partial system)
- Particulate and gaseous emissions from waste container filling and vitrification
- Particulate emissions from waste container topoff after vitrification.

All offgas treatment system connections to treatment equipment and the waste container tops will be sealed and the offgas ducting maintained under induced draft to prevent escape of pollutants.

With the exception of process additive management emissions, all emissions will be routed to an offgas treatment system prior to discharge to the atmosphere. Nominal efficiencies and the major pollutant controlled by the various offgas treatment system components used are provided in Table 4-2. Table 4-3 contains calculated removal efficiencies for major pollutants. Removal efficiencies were calculated using the Table 4-2 component efficiencies and the offgas treatment system arrangement in Appendix B. Appendix B contains additional information on the offgas treatment system components and efficiencies.

Table 4-2. Offgas Treatment Component Efficiencies

Component	Nominal Control Efficiency					
	Water/ Water Vapor	Organic Compounds	HCl	NO_x	SO_x	Particulate[1]
Baghouse	—	—	—	—	—	99%
Condenser	95 – 98%	50%	<10%	<10%	<10%	—
Mist Eliminator	10 – 25%	—	—	—	—	—
Sintered Metal Filter	—	—	—	—	—	99.5%
HEPA Filter	—	—	—	—	—	99.95%
Quench System	10 – 25%	10%	10%	10%	10%	10%
Packed Tower Scrubber (optional)[2]	—	90%	93%	93%	93%	<50%
Venturi Scrubber	—	25%	25%	25%	25%	95%
Selective Catalytic Reduction Unit(s)	—	—	—	99%[3]	—	—
Carbon Filter	—	95 – 99%	25%	25%	25%	—

[1] Particulate removal efficiencies are for ten-micron (10 μ) particle diameters and up. Removal efficiencies are based on AP-42 (EPA 1995), Appendix B.1, reference texts and process knowledge

[2] Efficiency range varies with pollutant adsorbed

[3] The selective catalytic reduction design goal is 99% efficiency

4.2.13 Process Additive Emissions Control

Particulate emissions from offloading and transfer of process additives will be controlled by dedicated baghouse and vent systems. A covered hopper with a sealed pneumatic conveying system will be used to transfer soil to the mixer/dryer soil holding tank or silos. Particulate matter collected at the baghouses is returned to the appropriate additive storage area for reuse.

4.2.14 Mixer/Dryer Offgas Emissions Control

The mixer/dryer emissions will be partially treated for moisture removal using a glycol-cooled condenser and mist eliminator prior to being routed to the main offgas treatment system. The partially treated offgases from this system will then be routed to the main offgas treatment system downstream of the chemical/venturi scrubber. Water condensed in the condenser and removed in the mist eliminator will be routed to a storage tank for sampling and subsequent treatment or disposal. Estimated rates and volumes of liquid secondary wastes generated from offgas emissions control system operations are provided in Section 2.6.

Table 4-3. Pollutant Removal Efficiencies[1]

Pollutant	Nominal Control Efficiency
Moisture	96%
Organic Compounds	98%
HCl	55%
NO_x	99.95%
SO_x	<50%
Particulate Matter	>99.9999%

[1] Based on arrangement of offgas treatment system components in Appendix B process flow diagrams

4.2.15 Phase 1 Main Offgas Treatment System

The Phase 1 offgas treatment system will consist of two stages of sintered metal particulate filters, a glycol-cooled condenser, a quench section, one of two redundant atomizing chemical scrubber/venturi scrubber, mist eliminator system, additional stages of HEPA filtration and up to two independent NO_x treatment devises.

Offgas from the melting process first passes through two stages of sintered metal particulate filtration. The purpose of the filters is to minimize radioactive contamination of downstream components to facilitate maintenance and operations. Dust collected from the sintered metal filters is recycled to the mixer/dryer. Dust from the final batch will be incorporated into the mixer/dryer where a final container using clean fill material will be processed to flush the system, and sent to the IDF or another permitted disposal facility. HEPA filters later in the system backup the sintered metal filters ensuring the particulate emissions are minimized.

After the sintered melt filters, the offgas passes through one of two redundant quenchers that cools the gas prior to introduction into the atomizing chemical scrubber/venturi scrubber. Either quencher can quench 100% of the offgas stream. In addition to quenching the offgas, the quencher augments the ability of the system to remove particulate matter and gaseous pollutants. Although this augmentation is not credited, it provides additional redundancy or capability to the offgas system.

Following the quencher, offgas is introduced into one of two redundant atomizing chemical venturi scrubbers. The atomizing chemical venturi scrubbers will be installed in parallel, with one in service and the other on standby. Either of the two atomizing chemical venturi scrubbers can scrub 100% of the offgas stream. Dilute sodium hydroxide will be injected in the atomizing scrubber section to reduce hydrogen chloride and other acid gas emissions. In addition to scrubbing hydrogen chloride and other acid gas emissions from the offgas, the scrubber augments the ability of the system to remove particles and NO_x. This augmentation is not credited but occurs nonetheless and provides additional redundancy or capability to the offgas system.

Following the atomizing chemical venturi scrubber, offgases will pass through an additional condenser and one of two redundant mist eliminators, with drainage from those units routed to the scrubber recycle tanks. Condensed liquids are drained into the scrubber recycle tank. An offgas heater, parallel HEPA filters, and a carbon filter for radioactive iodine removal will follow the mist eliminator.

NO_x treatment will be accomplished by a selective catalytic reduction (SCR) unit with a Tri-Mer packed tower scrubber as a back-up system. The packed tower unit consists of a quench unit and five towers in series that sequentially convert oxides of nitrogen to molecular nitrogen (N_2) by reduction reactions with chemical reagents (H_2SO_4, $NaClO_2$, NaS, and NaOH). Offgases will be discharged through a HEPA polishing filter, redundant exhaust blowers in parallel, and the system stack.

Reagents for the packed tower scrubber will be selected based on chemical species anticipated to be present in the offgases. Blowdown from the scrubber recycle tank will be sampled and routed to the ETF or other permitted Hanford Site facility for treatment and disposal.

Venturi scrubber blowdown contaminant types and their weight fractions/concentrations are provided in Table 4-4. If in service, the Tri-Mer packed tower will be used for only a portion of the vitrification cycle. Packed tower scrubber blowdown, also in the form of a continuous bleed stream, will be 16 L/min (4.29 gpm) and will produce approximately 194,950 L (51,500 gal) over the processing of a single waste container. Packed tower scrubber blowdown will consist of a sodium salt solution containing sulfates, sulfuric acid, sodium chlorite, sodium sulfide, sodium sulfite, sodium hydroxide, nitrates, and nitric acid. Carbon filters will be modular units rather than refillable contactors. Upon reaching saturation, the units will be removed, sampled, and disposed.

Table 4-4. Scrubber Blowdown Contaminants

Contaminant	Concentration
Sodium Hydroxide (NaOH)	2 % by weight
Sodium Nitrate ($NaNO_3$)	13 % by weight
Sodium Carbonate (Na_2CO_3)	2.5 % by weight
Sodium Sulfite (Na_2SO_3)	0.5 % by weight
Sodium Chloride (NaCl)	0.02% by weight
Sodium Fluoride (NaF)	4 ppm by volume
Cs-137	Trace

4.2.16 Phase 2 Main Offgas Treatment System

It is not expected that any enhancements of the offgas treatment system will be required between the end of Phase 1 and the beginning of Phase 2. However, if the Phase 1 offgas treatment system performance does not meet expectations, modifications to the system will be made. The packed tower scrubber may be used to allow the option of routing of exhaust gases either through the SCR(s) or the tower scrubber to determine the effect on both scrubbing efficiency and scrubber blowdown rates.

4.2.17 Control and Data Acquisition System

The DBVS control system and the associated data acquisition systems will be located in a trailer as shown in Figure 2-2. Some operating parameters may be monitored and operating steps may be performed manually as opposed to remotely. Personnel safety and ALARA considerations will require that many of the operations directly related to the process (mixer-dryer, melt station) be monitored and performed remotely. Other operations such as operation of the utilities, secondary waste, SCR, etc, will have key parameters monitored remotely while other monitoring and operating steps are manual. Both RD&D experiment data (process operating conditions) and offgas emissions data will be acquired.

4.3 SECONDARY WASTE STREAMS

4.3.1 General

All Test and Demonstration Facility secondary waste streams (i.e., any output stream other than the treated DBVS waste) will be managed in accordance with the *Hanford Site Liquid Waste Acceptance Criteria* (HNF-3172) or *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063) and the receiving TSD unit waste acceptance criteria for the treatment and/or disposal path for each stream. A waste minimization program for secondary wastes will be implemented. Shipments of waste to offsite treatment or disposal facilities are not anticipated. However, should they occur, these shipments will be conducted in compliance with WAC 173-303-280(1).

Nonradioactive nonhazardous waste streams include air pollution control equipment dusts from process additive transfer, used baghouse filters, empty process additive containers, and damaged/failed equipment. These waste materials will be managed as general solid waste per *Hanford Environmental Protection Requirements* (HNF-RD-15332).

4.3.2 Liquid Effluent Secondary Waste Streams

The Test and Demonstration Facility will produce the liquid secondary wastes noted in Table 4-5. The secondary waste stream will be sampled and analyzed prior to being routed to the ETF or other facility for treatment. Sampling and analysis will be performed in accordance with the waste acceptance criteria of the receiving disposal facility. Secondary wastes will be collected either continuously or at scheduled intervals and stored at the Test and Demonstration Facility in 68,140-L (18,000-gal) double-wall tanks. Up to 10 liquid effluent storage tanks may be onsite at the Test and Demonstration Facility at a given time, depending on the rate of waste generation and the duration of sampling and analysis. Sampling and analysis procedures are noted in Section 6.0. When a tank is filled, its contents will be sampled and the waste will be transported to the ETF. If required, wastes will be filtered prior to shipment to ETF. If the waste does not meet ETF waste acceptance criteria, it will be sent to a DST or other approved Hanford Site storage facilities.

Tank construction will meet the requirements of WAC 173-303-640 and will be equipped with freeze protection consistent with Performance Category-2 (ambient temperature of 34°C [30°F]).

Table 4-5. Liquid Secondary Wastes

Waste	Source	Frequency of Generation	Pollutants
Washdown Water	Equipment Cleaning, Spill Remediation	Recurring (Equipment Cleaning) Infrequent (Spill Remediation)	Particulate Matter, Radionuclides, Caustic (high pH) Solution
Boiler Blowdown	Boiler Maintenance	Infrequent	Particulate Matter, Boiler Antifouling Agents, Surfactants
Mixer/Dryer Condenser, Mist Eliminator Drainage	Mixer/Dryer Offgas Condenser, Mist Eliminator Operation	Recurring (Scheduled Holding Tank Discharge)	Particulate Matter, Radionuclides
Scrubber System Blowdown or Bleed	Main Offgas Treatment System Operation	Recurring (Scheduled Scrubber Holding Tank Blowdown) Continuous (Scrubber Holding Tank Bleed)	Particulate Matter, Radionuclides, Caustic (high pH) Solution, Dissolved Inorganic Gases, Dissolved Acid Gases, Organic Compounds

4.3.3 Solid/Semisolid Secondary Waste Streams

The Test and Demonstration Facility will produce the solid, semisolid, or sludge secondary wastes noted in Table 4-6. Unless otherwise stated, these wastes will be collected on a scheduled basis and disposed in permitted facilities. Wastes that will routinely be returned to process use, such as spilled nonhazardous process additives, are not included in this list.

Table 4-6. Solid/Semisolid Secondary Wastes

Waste	Source	Frequency of Generation	Pollutants
Spent Carbon Filters	Main Offgas Treatment System	Scheduled or Upon Detection of Pollutant Breakthrough	Particulate Matter, Radionuclides, Organic Compounds
Spent HEPA Filters	Mixer/Dryer Offgas Treatment System, Main Offgas Treatment System, ICV® Purge Air Inlet	Scheduled	Particulate Matter, Radionuclides, Organic Compounds
Spent SCR Catalyst	Main Offgas Treatment System	Scheduled or Upon Detection of Catalyst Fouling/Poisoning	Particulate Matter, Radionuclides, Organic Compounds
Scrubber Tank Sludge	Main Offgas Treatment System	Scheduled or Upon Detection of Excessive Buildup	Inorganic Solids, Water Containing High or Low pH Inorganic Compounds, Radionuclides, Caustic (high pH) Solution, Organic Compounds
Used Personal Protective Equipment	Equipment Cleanup, Maintenance, and Operation	Recurring	Particulate Matter, Radionuclides
Failed/Damaged Equipment	Equipment Cleanup, Maintenance, and Operation	Recurring	Particulate Matter, Radionuclides

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Section 7.2.3
Daily Inspections

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7.2.3 Daily Inspections

Daily inspections will include the following:

- Areas subject to spills
- Accessible tank systems, including tanks, pumps, piping, valves, flanges, and other ancillary equipment
- The accessible aboveground portions of waste transfer piping and waste vacuum transfer lines
- Monitoring data from any leak detection equipment
- The construction materials and the area immediately surrounding the externally accessible portion of tank systems, including secondary containment systems.

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Section 7.4
Corrective Action

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7.4 CORRECTIVE ACTION

The inspection checklists for each activity or area contain a signature and date block for review and approval of corrective actions (if any) by the operator. Discrepancies and non-compliant conditions noted on the checklist must be corrected at the first opportunity as indicated in the PER procedures. Typical inspection checklists for containerized waste storage areas and waste tank systems are provided in Figures 7-1 and 7-2, respectively.

CH2M HILL is responsible for committing staff and resources to correct any noted conditions. Once a condition is corrected, the inspector is required to sign the inspection checklist, noting the area has been reinspected and is in compliance with permit requirements. The inspector must also provide a brief description of those actions in the space provided. A corrective action log will be maintained by the facility.

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Section 7.5
Recordkeeping

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7.5 RECORDKEEPING

An inspection log containing all completed inspection reports and supporting documentation for corrective actions taken must be maintained for each calendar year in accordance with WAC 173-303-380. The inspection log will provide a case history of all items and areas inspected. A current copy of the corrective action log must be kept with the inspection log.

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Figure 2-2
Test and Demonstration Facility Site and Equipment Layout – Page 1

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Figure 7-2
Typical Inspection Checklist for Waste Tank Storage Area

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Figure 7-2. Typical Inspection Checklist for Waste Tank Storage Area

AREA: ____

INSPECTOR: ______________________ DATE: __________

NOTE TANK DESIGNATIONS AND CONTENTS ON ATTACHED TABLE.

1. Are tank shell, valves, gauges, etc. in good condition and free of leaks?

   YES □ NO □ COMMENT □

2. If so equipped, is tank insulation in good repair?

   YES □ NO □ COMMENT □

3. Is tank containment in good condition?

   YES □ NO □ COMMENT □

4. If so equipped, are tank containment drain valve(s) secured in the closed position?

   YES □ NO □ COMMENT □

5. Is tank containment free of accumulated liquids, including precipitation?

   YES □ NO □ COMMENT □

6. Have spills from liquid transfer operations been cleaned up?

   YES □ NO □ COMMENT □

7. Are suitable and adequate spill control supplies and equipment available in the area?

   YES □ NO □ COMMENT □

8. Is area drainage in good repair?

   YES □ NO □ COMMENT □

9. Has local sedimentation or erosion occurred around tank or containment since last inspection?

   YES □ NO □ COMMENT □

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Appendix B
Process Flow Diagrams

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APPENDIX B

PROCESS FLOW DIAGRAMS

FIGURES

PERMIT ATTACHMENT LL

Emergency Preparedness and Prevention – Following Sections and Appendices of The Permit Application:

Section 4.0	Bulk Vitrification Test and Demonstration Facility
Section 5.0	Operations Plan
Appendix B	Process Flow Diagrams
Appendix E	Emergency Condition Parameter Limit Values
Appendix F	ICV® Container Refractory Information

Permit Number: WA 7890008967

The following listed documents are hereby incorporated, in their entirety, by reference into this Permit. Some of the documents are excerpts from the Permittees' DBVS Facility Research, Development, and Demonstration Dangerous Waste Permit Application dated May 10, 2004 (document #04-TED-036); hereafter called the Permit Application. Ecology has, as deemed necessary, modified specific language in the attachments. These modifications are described in the permit conditions (Parts I through V), and thereby supersede the language of the attachment. These incorporated attachments are enforceable conditions of this Permit, as modified by the specific permit conditions.

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Appendix B
Process Flow Diagrams

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APPENDIX B

PROCESS FLOW DIAGRAMS

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FIGURES

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Appendix E
Emergency Condition Parameter Limit Values

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APPENDIX E

EMERGENCY CONDITION PARAMETER LIMIT VALUES

Information to be provided. As discussed with the Washington State Department of Ecology on April 22, 2004, provision of this information will be required as a permit condition.

Appendix F
ICV® Container Refractory Information

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APPENDIX F

ICV® CONTAINER REFRACTORY INFORMATION

Information to be provided. As discussed with the Washington State Department of Ecology on April 22, 2004, provision of this information will be required as a permit condition.

MITIGATED DETERMINATION OF NONSIGNIFICANCE

Description of proposal

Issue of a dangerous waste research, development and demonstration (RD&D) permit for the U.S. Department of Energy, (USDOE) Office of River Protection (ORP) Demonstration Bulk Vitrification System (DVBS) on the Hanford Site. On May 10, 2004, ORP submitted a certified permit application to the Washington Department of Ecology, Nuclear Waste Program (NWP) to comply with Washington Administrative Code (WAC) Chapter 173- 303-809 Research, Development and Demonstration permits. The proposed DVBS Facility will test the viability of in-container vitrification of actual Hanford tank waste in a full-scale test program for up to 400 operating days. As ORP has proposed it, this DBVS Facility RD&D project will provide data for waste form qualifications, risk assessments, and performance assessments for tank waste treatment and near-surface land disposal. In conducting bulk vitrification, ORP seeks to evaluate the ability of the process to produce immobilized low-activity waste forms. In addition, ORP will gather data to determine if the DVBS Facility can meet the applicable environmental regulations, including emissions standards, in a full-scale production facility,

The DVBS Facility will be located west of and adjacent to the 241-S Tank Farm in the Hanford 200 West Area. The Facility will treat waste that the Tank Farms operations contractor (CH2M Hill Inc.) will retrieve as a solution from Single Shell Tank (SST) 241-S-109. As ORP proposed the plan for the operation of the DBVS Facility, the system operators will conduct up to 50 campaigns, each of which will vitrify waste in a single container. The campaigns will be grouped in two phases. Phase 1 will consist of treatment of up to three container loads of non-radioactive simulants, with each incorporating up to approximately 300 gallons of radioactive mixed tank waste and no more than 1,080 gallons total of waste from SST 241-S-109. When Phase 1 ends, the treatment system will be upgraded to allow higher waste concentrations to be treated at increased rates, while ensuring air emissions standards are met. Phase 2 will consist of treatment of up to 300,000 gallons of waste from SST 241-S-109, processing up to 50 containers of radioactive mixed tank waste (including containers vitrified in Phase 1).

NWP staff performed a threshold determination to determine whether an Environmental Impact Statement was required to evaluate the likely environmental impacts resulting from permitting the DVBS Facility, as required by WAC 197-11-050(2)(a). As a result of reviews of the draft DVBS Facility RD&D permit application and its State Environmental Policy Act (SEPA) checklist that ORP provided with that application, the NWP staff determined that environmental impacts resulting from the DVBS could be mitigated. Mitigation measures will be imposed by permit conditions that govern design, construction, operations, and closure activities. To inform the public of its determination, the NWP has prepared this Mitigated Determination of Nonsignificance, per the requirements of WAC 197-11-350(3). A more detailed description of the DVBS is included in Attachment 1.

A summary of the mitigation measures that will help to mitigate the potential for significant impacts to the environment is included in Attachment 2.

Proponent U.S. Department of Energy, Office of River Protection, Richland, WA

Location of proposal, including street address, if any U.S. Department of Energy Hanford Site, 200 West Area, northwest of the city of Richland, WA

Lead agency Washington Department of Ecology, Nuclear Waste Program

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030 (2) (c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

☐ There is no comment period for this DNS.

☐ This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

X This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 45 days from the date below. Comments must be submitted by September 9, 2004.

Responsible official Mike Wilson

Position/title Manager, Nuclear Waste Program
Phone. (360) 407-7150

Address P.O. Box 47600, Olympia, WA 98504-7600

Date. 7/22/04 Signature [signature]

The following mitigation measures for the proposal are required and will be included as conditions of the permit:

See Attachment 2.

☐ You may appeal this determination to ______
at ______
no later than ______
______ by electronic mail ......

You should be prepared to make specific factual objections.
Contact ______ to read or ask about the procedures for SEPA appeals.

X There is no agency appeal.

ATTACHMENT 1

BULK VITRIFICATION DEMONSTRATION FACILITY

FACILITY COMPONENTS

The DBVS (DVBS) Facility consists of trailer-mounted and skid-mounted equipment suitable for field installation, operation, and removal at the completion of the project. The system includes the following major components, systems, and areas:

- Waste retrieval system
- Waste stimulant and staging tank(s) and pumps
- Process additive storage/handling
- Waste feed preparation (mixer/dryer)
- Vitrification container preparation system
- In-container vitrification (ICV®) system
- Electrical equipment
- Offgas treatment system
- Control and data acquisition system
- ILAW storage
- Secondary waste storage and handling (containers or tanks).

Support systems required for operation of the DBVS include:

- Control station
- Personnel contamination control and survey station
- Personnel rest areas (e.g., lunch room and restrooms)
- Change room
- Safety showers and eye wash stations
- Backup generator.

The DBVS will use existing infrastructure to the maximum extent possible. Unit-specific installation, operational, and closure needs of the DBVS may cause some infrastructure elements to be modified, augmented, or added.

Potential infrastructure elements include:

- Utilities (water, electric power, sewer, steam)
- Communications (telephone and computer)

- Roadways
- Radioactive material containment
- Hazardous material containment
- Secondary waste storage/transfer systems
- Treated waste storage/transfer systems.

WASTE DESCRIPTION

The waste in Tank Single Shell Tank (SST) 241-S-109 is stratified. On the bottom is a layer of sludge. On top of the sludge is a mixed saltcake solid and liquid layer, topped by a layer of drained saltcake. The saltcake waste is the source waste material for the DBVS.

The waste in 241-S-109 underwent prior pretreatment. Hanford Site contractors removed reduction and oxidation (REDOX) salt waste stored in 241-S-109 from December 1952 to February 1974 and concentrated it using the 242-S Evaporator, between November 1973 and February 1974. Residual sludge (13,000 gal) and salt waste (66,000 gal) remained in 241-S-109 after most of the waste was removed and concentrated then transferred to other SSTs (241-S-103/105/106).

From February through September 1974, contractors transferred concentrated salt waste from the 242-S Evaporator into 241-S-109. That waste resulted from concentration of waste from many SSTs in the Hanford 200 Areas. By September 1974, 241-S-109 contained 653,000 gal of solids (mostly saltcake) and 47,000 gal of supernatant. The 242-S Evaporator had concentrated supernatant waste decanted from several tanks that had been processed through the Hanford B Plant for cesium removal via ion exchange. In storage in the 241-S-109, the waste crystallized, which concentrated the soluble cesium-137 remaining in the interstitial liquid within the crystal matrix. Contractors added more waste to 241-S-109 after 1974.

In 2001, contractors conducted saltwell pumping operations to remove the free liquids in the tank, which probably resulted in removal of more dissolved cesium. The average concentration of cesium-137 (Cs-137) in the saltcake is now 0.09 curies/liter (Ci/L) in a 7 molar sodium waste.

Some characterization of the waste in Tank 241-S-109 was previously conducted. Characterization results represent the Best Basis Inventory (BBI) for the liquid and saltcake fractions of the tank waste. Sampling of the sludge at the bottom was not conducted recently; however, ORP assumes that the sludge is present. The composition of the waste retrieved during different phases of RD&D operations will depend on the relative amounts of interstitial liquid that has been characterized and the dissolution brine retrieved, which will vary.

The interstitial liquid is the liquid phase that currently exists in the tank and contains the highly soluble components, including the bulk of the cesium-137. The composition of this liquid is constant and established by analysis of saltwell grab samples. The dissolution brine is the liquid phase formed as the solid saltcake is dissolved through the addition of water. The brine is composed of the relatively soluble components in the salt phase. The composition of the dissolution brine is established through modeling and changes over the course of the retrieval process. The exact ratio of these liquids retrieved in the different phases is not known, but an approximate composition can be established via a general understanding of the effects of dissolution on the waste.

PHASE 1 BULK VITRIFICATION

In Phase 1, the Facility will receive dissolved tank waste from Single Shell Tank (SST) 241-S-109. The US Department of Energy (USDOE) will test pretreatment by means of selective dissolution in 241-S-109 before the waste is pumped to the DVBS Facility. Selective dissolution is the chemical separation of soluble chemicals (including cesium-137) using the differences in their solubility from the interstitial liquid held in the tank's solid waste during retrieval. The resulting effluent will be routed to the Double Shell Tank (DST).

When the waste (in the form of a waterborne salt solution) is pumped from 241-S-109, it will be routed through a hydroclone-separator device to a 1,000-gallon double wall staging tank. The separator will remove solid particles from the waste stream and route them to a collection chamber. The liquid waste will move upward to the center of the separator. A three-way valve will route the liquid waste to either the DBVS Facility waste simulant and staging tank or to the DST system for storage and eventual disposal. When Phase I waste retrieval first begins, the waste will be routed to the DSTs. The tank farms operations contractor will monitor transfer data, while the waste is routed to the 241-SY tank farm nearby. When the waste characteristics are judged acceptable for processing in the DBVS, the three-valve will be activated to send the waste to the waste staging tank.

The waste simulant and staging tank will contain only one inlet-outlet combination, which will ensure that the waste staging is physically disconnected from the DBVS Facility during filling. If the waste in the waste simulant and staging tank meets the waste acceptance criteria for treatment, the waste will be pumped to a mixer/dryer unit in the DBVS Facility. If the waste does not meet the DBVS Facility waste acceptance criteria, it will be routed to the DST system.

The waste will be mixed with additives and dried in a mixer/dryer unit under vacuum to promote moisture removal at reduced temperatures. Multiple batches of waste may be dried in the mixer/dryer unit for six to eight hours. The dried material will be vacuum transferred to feed hoppers. From the hoppers, the dried material will be gravity fed through an enclosed chute with shutoff valves to the vitrification container.

Before the dried material is fed into it, the container will be lined with sand and an insulating layer. A layer of minerals and soil will be placed in the container prior to vitrification. The container will be constructed with a sampling port to allow sampling of the vitrified waste.

A steel lid with attached electrodes will be sealed to the container by bolted flanges and a refractory gasket prior to addition of the dried material. An ancillary waste transfer enclosure that seals to the container lid will be placed over the sealed container to provide containment during connection of the waste and soil additions and during the melt process.

The waste mixture, including simulants and glass formers, will be fed into the container through ports in the sealed container lid. Electric power will be supplied to the electrodes installed in the container lid, providing resistive heating to vitrify the container contents. The immobilized low activity waste (ILAW) that results will be a dangerous and/or mixed waste form suitable for burial in an approved land disposal facility.

Ambient air flow will be introduced to establish and maintain airflow to through the container to the offgas treatment system during vitrification, to cool the vitrification offgases, and to provide protection against excessive temperatures to the high efficiency particulate air (HEPA) filters in the emissions control system.

Tests will be conducted to determine the most efficient method for melting the wastes, from the top to the bottom of the container versus the bottom to the top. Bottom-up melting will be the preferred melting procedure; however, some top-down melting may be conducted to test the process.

After vitrification is completed, the container will remain attached to the off-gas treatment system. The contractor will add clean fill to the cavities around the top of the electrodes and over the top of the vitrified mass to minimize headspace in the container and to meet disposal site criteria.

The contractor will core the vitrified waste to collect samples through the side sampling port. When the sampling is complete, the contractor will seal the sampling port, perform radiation surveys, and then decontaminate the exterior of the container. Containers of vitrified wastes from RD&D activities are expected to be disposed of on-site in a RCRA-permitted disposal facility. Should on-site disposal capacity be available prior to completion of the RD&D project, containers of vitrified wastes can be disposed of prior to or as part of the DBVS Facility closure. Otherwise, containers of vitrified wastes will be stored within the DBVS Facility or other on-site permitted container storage areas, such as the Central Waste Complex. The vitrified waste form in the container will be sampled and analyzed in accordance with the Ecology approved DBVS Facility campaign plan.

PHASE 2 BULK VITRIFICATION

In Phase 2, several changes will be made in the design and operation of the DVBS Facility. The 1,000-gallon waste staging tank will be bypassed, waste transfer rates will increase from 241-S-109, the solids/liquid separator and the sensing instrumentation will be retained but the flow rates will increase, and the number of waste simulant and staging tanks will increased. Increasing the number of waste simulant and staging tanks will allow one or more tanks to be used to provide waste feed for treatment, while other tanks are being filled and sampled.

WASTE DISPOSITION

Vitrified Low Activity Waste

Containers of treated waste resulting from the bulk vitrification process will be placed in a dedicated temporary storage area at the DBVS Facility. Should on-site disposal capacity be available prior to completion of the RD&D project, containers of vitrified wastes can be disposed of prior to or as part of the DBVS Facility closure. The storage area will be designed to hold all containers of treated waste generated during the project and will be equipped with secondary containment provisions (impervious floor, curb, and sump). All containers, handling procedures and handling equipment will meet the waste acceptance criteria of the accepting disposal Facility. Final disposal of treated waste will be at a permitted disposal facility

Liquid Secondary Waste Streams

The DBVS Facility will produce secondary liquid waste streams (washdown water; boiler blowdown, mixer/dryer condenser, mist eliminator drainage); scrubber system blowdown or bleed). These wastes will be collected either continuously or at scheduled intervals. They will be stored at the DBVS Facility in portable tanks. Up to ten 68,140L (18,000 - gal) tanks may be used. The actual capacity and number of tanks will be determined during the DBVS project. Tank systems will comply with the applicable portions of WAC 173-303-640.

Liquid wastes will be disposed of at the 200 Area Effluent Treatment Facility (ETF); therefore, waste will be characterized in accordance with the waste characterization requirements specified in Section 3 of the *Hanford Site Liquid Waste Acceptance Criteria* (HNF-3172). The sampling frequency will be every tank during Phase I. The long-term sampling frequency will be determined by the results of initial testing.

Solid Secondary Waste Streams

A wide variety of solid and semisolid wastes will be generated during the DBVS Facility operations. Waste streams include, but are not limited to, waste material residues in receipt and holding tanks, collected air pollution control equipment dusts/sludges, discarded protective equipment, and discarded samples taken during testing. These materials will be properly designated and packaged per the permit and HNF-EP-0063 and managed at the appropriate TSD unit in accordance with the unit's waste acceptance criteria.

Solid waste streams that are designated as dangerous and/or mixed waste per WAC 173-303 will be transferred to a Hanford Site TSD unit in accordance with the current *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063) and the waste acceptance criteria of the receiving TSD unit.

CLOSURE OF THE DBVS FACILITY

Closure of DBVS Facility differs from closure of a tank farm waste management unit at the Hanford Site. All equipment and facilities in the DBVS Facility are located west of and adjacent to the 214-S Tank Farm; however, they are all considered to be temporary. No permanent waste storage or disposal facilities will be constructed at the DVBS Facility. Closure activities are governed by a closure plan approved by Ecology and the conditions in the permit in Sec. II.H. Any releases from the DBVS Facility will be remediated to meet cleanup standards specified in the permit.

Per WAC 173-303-610(2)(a), the DBVS Facility will be closed in a manner that protects human health and the environment, minimizes the need for further maintenance, and returns the land to the appearance and use of surrounding land areas. Closure will require the removal and disposal of all dangerous and/or mixed waste present, removal of contaminated process equipment and contaminated structural components, and removal of all soil contaminated by the RD&D project.

Any materials, equipment, or structures removed will be designated in accordance with WAC 173-303-070 and disposed. Equipment that does not meet the clean debris rule or cannot be 100% inspected will be managed as mixed waste and disposed appropriately. Any residue remaining in the waste retrieval system and DBVS piping and equipment will be removed during decontamination and managed as mixed waste.

Structures and equipment anticipated to be contaminated at the start of the closure period include tank and pipe surfaces, ancillary equipment, and concrete containment structures. Decontamination technologies will be selected based on demonstrated effectiveness in a radioactive environment and the ability to successfully achieve the closure performance standards. Specific methods of decontamination for the treatment unit components and equipment will be determined at the time of closure. These methods will be based on information in the operating record, existing radiation levels, and ORP plans for future use, if any, of the equipment.

Air emission control equipment will remain in-place and in operation when it is needed to facilitate treatment equipment deactivation and decontamination. Equipment will be taken out of service in stages as contamination is progressively removed or reduced. Compliance with applicable air emission standards will be maintained. Air permits in place during the operational phase will be reviewed to determine applicability during the closure period and modified as necessary per applicable regulations.

The Ecology approved Sampling and Analysis Plan (SAP) will describe the approach to be followed for confirming that decontamination and/or removal activities have attained the closure performance standard.

Within 60 days of completion of closure activities for the Facility, a copy of the closure certification, signed by the owner or operator, and an Independent Qualified Registered Professional Engineer, will be transmitted, via registered mail, to Ecology and placed in the administrative record. The certification of closure will cover only the portions of the

Facility covered by the closure activities proposed. The certification will occur upon disposition of waste generated from decontamination and completion of closure activities. The Independent Qualified Registered Professional Engineer will provide a signed statement that meets the applicable requirements of WAC 173-303-610(6), certifying that the closure activities were performed in accordance with the technical specifications of the approved closure plan for the Facility.

ATTACHMENT 2

PERMIT CONDITIONS THAT MITIGATE POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACT

The Washington Department of Ecology, Nuclear Waste Program prepared a draft Research, Development, and Demonstration (RD&D) Project dangerous and/or mixed waste permit for the construction, operation, and closure of the Supplemental Treatment DBVS Facility under its permitting authority in WAC 173-303-809.

The draft permit imposes conditions that will mitigate the risk to the environment and public health. The condition:

- govern the engineered components that make up the Facility
- limit the quantity and form of the waste that the Facility may receive, treat, and store
- restrict the duration of the Facility's operation
- require the Facility to train workers and to have emergency response actions planned
- require that records be created and maintained

Engineered Components

Tank Systems

Tank systems used to receive, treat, and store SST 241-S-109 waste will be governed by the provisions of Part IV of the permit. The permit conditions were imposed to ensure waste is handled safely and in compliance with existing regulations.

The waste storage tank in Phase 1, the waste simulant and staging tanks in Phases 1 and 2, and the liquid effluent storage tanks will be designed and constructed to contain the 241-S-109 wastes or liquid effluents, in compliance with WAC 173-303-640. Waste simulants that will be used during Phase 1 will also be stored in a double-wall tank that may be used as a waste storage tank in Phase 2 or removed from the site after Phase 1 and disposed per WAC 173-303 Dangerous waste regulations.

All waste storage tanks will be equipped with secondary containment in the form of either double-walled vessels (waste storage tanks) or containment systems with sumps. All tank systems will be equipped with leak detection systems.

Tank installation and integrity testing will be certified by an independent, qualified registered professional engineer.

Transfer Lines

Lines transferring liquid tank waste from 241-S-109 to the waste storage tank, from the waste storage tank to the waste simulant and staging tanks, and from the waste simulant and staging tanks to the mixer/dryer unit will be double contained lines to prevent releases of waste to the environment. The lines may be above-ground hose-in-hose transfer lines or underground pipe-in-pipe lines.

Containment Systems

In Phase 1, a Waste Staging Tank Skid, constructed with leak detection, secondary containment, waste staging tank ventilation, and tank overflow protection will be used to transfer waste from 241-S-109 to the waste simulant and staging tank. Waste will be removed from tank 241-S-109 by a jet pumping system similar to that used for interim stabilization of the single shell tanks. The pump, solids/liquid separator, and sensing systems will be located in a pump pit containment structure adjacent to the 241-S-109.

Liquid chemical storage areas (for sulfuric acid, sodium chlorate, sodium sulfide, and sodium hydroxide) will be constructed with spill containment.

The mixer/dryer, vitrification, cooldown, and topoff/survey stations will be provided with radiation shielding and secondary containment.

All waste connection points on the vitrification waste container lid will be equipped with secondary containment and spilled material recovery equipment during material transfer, melting, and cooldown. The containment will be in for the form of an ancillary waste transfer enclosure that will seal to the container lid before waste is added to the container. The enclosure will be removed when the vitrified waste is cool enough to add clean fill.

Offgas Treatment

Emissions from the DBVS Facility will also be controlled by air permits. These may include an emissions source construction permit, a radioactive emissions source construction permit, a permit for National Emissions Standards for Hazardous Air Pollutants (NESHAP), a radioactive air emissions notice of construction application for a categorical tank farm Facility waste retrieval and closure, and a notice of construction for criteria and toxics air emissions.

Air emissions from the DBVS may be in the form of fugitive emissions or point sources (ventilation stacks). Fugitive emissions from the DBVS Facility shall be controlled by maintaining/operating the DBVS offgas systems.

Engineered control systems will be installed to control emissions from point sources. Point sources may release non-radioactive and radioactive pollutants. Continuous emissions monitoring systems (CEMS) will monitor and record emissions of radionuclides that emit beta and gamma radiation and Clean Air Act criteria pollutants (particulate matter, carbon monoxide, organics, oxides of nitrogen, and oxides of sulfur).

The CEMS will be designed, installed, and operated in compliance with applicable portions of the RD&D permit.

All emissions will be routed through an offgas treatment system prior to discharge to the atmosphere. Emissions from offloading and transfer of process additives (e.g., glass formers) will be controlled by a baghouse and vent system. A covered hopper with a sealed pneumatic conveying system will transfer soil to the mixer/dryer soil holding tank or silos. Particulate collected by the baghouse will. be returned to the additive storage area for reuse.

Mixer/dryer emissions will be subjected to moisture removal measures that use a glycol-cooled condenser then routed to the main offgas treatment system downstream to mist eliminator #3. Water condensed in the condenser and removed in the mist eliminator will be routed to a storage tank for sampling and treatment or disposal.

The Phase 1 offgas treatment system will be a two-stage system made up of sintered metal particulate filters, a glycol-cooled condenser, a quench section, one of two redundant atomizing chemical scrubber/venture scrubber, mist eliminator system, added stages of HEPA filtration, carbon filter, and up to two independent nitrogen oxides treatment devises. The sintered metal filters will remove dust to minimize radioactive contamination. The HEPA filters will provide added particulate removal.

The quenchers will cool the gas before it enters the atomizing chemical scrubber/venturi scrubber. In addition, the quenchers provide some particulate matter, metals, and gaseous pollutant removal. The chemical scrubber systems will inject dilute sodium hydroxide into the offgas stream to reduce hydrogen chloride and other acid gases. A mist eliminator will follow. An offgas heater, parallel HEPA filters, and a carbon filter to capture radioactive iodine and organics will follow.

Oxides of nitrogen will be removed by a selective catalytic reduction (SCR) unit, with a Tri-Mer packed tower scrubber system as a back-up. The packed tower unit is composed of a quench unit and five towers in series that convert oxides of nitrogen to molecular nitrogen by reduction reactions with chemical agents. Offgases will be discharged through a HEPA polishing filter, redundant exhaust blowers in parallel, and the system stack.

The pollutants collected in various portions of the air emissions system are managed to prevent their release to the environment. Dust collected from the sintered metal filters will be recycled to the mixer/dryer, until the final batch when a final container using clean fill material will be processed to flush the system. The flushed material will be sent to an onsite permitted disposal Facility. HEPA filters will be disposed on site when spent or at the end of the RD&D permit. Condensed liquids from the mist eliminators in the scrubbers will be collected in a scrubber recycle tank. Blowdown from the scrubber recycle tank will be sampled and routed to the Effluent Treatment Facility (ETF) or other permitted Facility for treatment and disposal.

For Phase 2, the emissions system is not expected to require enhancement; however, any enhancements made are subject to prior approval by Ecology.

Leak Detection Systems

Leak detection instruments for the tank systems in the DVBS Facility tanks will be listed in the Permit in Table IV.3. Leak detection systems for the DVBS system will be listed in Permit tables V.3 and V.6

Administrative Controls

Campaign Plans

Ecology required ORP to prepare a written plan for each container to be created during the RD&D. The plan must be reviewed and approved by Ecology prior to initiation of a campaign.

Summary Report

ORP will submit to Ecology a draft DBVS campaign summary report within 90 days after the completion of each campaign that will include such information as preliminary analytical data, meting performance standards, organ design capacity, etc.

ORP wil submit to Ecology the final DBVS campaign summary report 120 days fater the completion of the final campaign summary report as specified in the permit condition V.I.9.

When a campaign is complete and the results of waste analyses are complete, ORP will prepare and submit a summary report. At the completion of Phase 1, ORP will submit a report on test conduct, findings, and conclusions.

ORP will also submit campaign reports for Phase 2 campaigns. At the end of Phase 2, the campaign reports will be combined in to a comprehensive report for Phases 1 and 2.

Waste Sampling Plan

Included in the permit is the requirement for ORP to submit an updated waste analysis plan for Ecology approval. That Plan will provide the basis for measuring the adequacy of waste treatment and assist in optimizing the waste treatment operation based on treated waste analysis results and off gas emissions.

In Phase 1, the contents of the waste staging tank must be sampled before the waste is sent to the waste simulant and staging tanks. Wastes will be sampled in the waste simulant and waste staging tanks in Phase 2. Dangerous and/or mixed waste constituents identified in the permit will be checked/analyzed for each container of vitrified waste, as specified in the Ecology approved campaign plan.

In addition, all secondary liquid waste streams must be sampled before transport to ETF to ensure that they can be processed at the ETF and land disposed. All solid secondary wastes must be sampled to verify that they meet the Hanford Solid Waste Criteria for onsite disposal.

Reporting

Ecology is requiring ORP to provide a variety of reports. Those that must be made to protect human health and the environment are reports of any incidence of non-compliance with the permit that may result in a threat to the environment or human health, reports of any time that the Facility contingency plan is activated, and reports of any emergency situations. In addition, Ecology is requiring ORP to provide annual reports of operations, campaign reports, and cost estimates for closure.

Restriction Of Quantities and Form of Wastes To Be Treated

The DVBS Facility will operate only to treat the waste in SST 241-S-109. No other SST waste is permitted to be treated in the system. Up to 1,080 gallons of ST 241-S-109 waste may be treated in Phase 1 and up to 300,000 gallons of SST 241-S-109 waste may be treated in Phase 2. The DBVS Facility will be allowed to store only vitrified wastes or secondary wastes generated as part of the process or resulting from operation of emissions control equipment.

Training

The permit requires all personnel who operate the DBVS Facility or the emission control equipment to be properly trained per Condition II.E and WAC 173-303-330 and WAC 173-303-680(2).

Records

Condition II.G of the permit stipulates the records that must be created and maintained for the DBVS. These records are required by WAC 173-303-380 for owners and operators of treatment, storage and disposal facilities for maintenance in the Facility operating record.

STATE ENVIRONMENTAL POLICY ACT ENVIRONMENTAL CHECKLIST

FOR A BULK VITRIFICATION TEST AND DEMONSTRATION FACILITY

May 2004

WASHINGTON ADMINISTRATIVE CODE ENVIRONMENTAL CHECKLIST [WAC 197-11-960]

A. BACKGROUND

1. Name of proposed project, if applicable:

Bulk Vitrification Test and Demonstration Facility.

This *Washington State Environmental Policy Act* (SEPA) environmental checklist is being submitted in support of the application for a Research, Development, and Demonstration (RD&D) Permit under the *Resource Conservation and Recovery Act of 1976* (RCRA), 42 USC 6901 et seq., and its implementing regulations, Title 40, Code of Federal Regulations, Part 270.65 (40 CFR 270.65) and the *Washington Administrative Code* (WAC) 173-303-809.

2. Name of applicant:

U.S. Department of Energy (DOE)

3. Address and phone number of applicant and contact person:

Mr. Roy J. Schepens
Office of River Protection
U.S. Department of Energy
P.O. Box 550
Richland, WA 99352
(509) 376-7395

4. Date checklist prepared:

May 2004

5. Agency requesting checklist:

Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

6. Proposed timing or schedule (including phasing, if applicable):

The Bulk Vitrification Test and Demonstration Facility is scheduled to be constructed beginning in January 2005.

7. **Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.**

Yes. The purpose of the Bulk Vitrification Test and Demonstration Facility is to collect data on the ability of the bulk vitrification technology to treat pretreated saltcake wastes from the Hanford single-shell tanks (SSTs). These data will then be used to determine whether the technology is appropriate for full-scale development at the Hanford Site. The Test and Demonstration Facility will be dismantled at the termination of the testing program in accordance with the requirements under the RD&D RCRA permit conditions. If the decision is made to fully develop this bulk vitrification technology, a new full-scale facility will be constructed after compliance with applicable regulatory requirements, including a new SEPA checklist for the full-scale facility.

8. **List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.**

DOE has determined that this proposed project meets its criteria for a Categorical Exclusion and therefore, does not require preparation of an Environmental Impact Statement or Environmental Assessment under the National Environmental Policy Act (NEPA), 42 USC 4321 et seq. A Categorical Exclusion (CX) has been prepared for the Test and Demonstration Facility in accordance with the NEPA and DOE implementing regulations, 40 CFR 1500 - 1508 and 10 CFR 1021.

General information concerning the Hanford Facility environment can be found in the *Hanford Site National Environmental Policy Act (NEPA) Characterization* report (PNNL-6415). This document is updated annually by the Pacific Northwest National Laboratory (PNNL) and provides current information concerning climate and meteorology, ecology, history and archaeology, socioeconomics, land use and noise levels, and geology and hydrology. These baseline data for the Hanford Site and past activities are useful for evaluating proposed activities and their potential environmental impacts.

The following information has been developed that is directly related to this demonstration project:

- *Categorical Exclusion for Treatability and Demonstration Testing of Supplemental Technologies, Hanford Site, Richland, Washington* (DOE/ORP-2003-24).
- *Research, Development and Demonstration Application for Supplemental Treatment Test and Demonstration Facility* (DOE/ORP-2003-23).
- *Tank S-109 Partial Waste Retrieval Functions and Requirements* (RPP-18812).

9. **Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.**

No known applications are pending for government approvals of other proposals directly affecting the proposed property.

10. List any government approvals or permits that will be needed for your proposal, if known.

Ecology is the lead agency authorized to approve the RD&D permit application for the proposed Test and Demonstration Facility, pursuant to the requirements of WAC 173-303-809, and the U.S. Environmental Protection Agency Code of Federal Regulations, 40 CFR 270.65. Retrieval of saltcake waste from Tank 241-S-109 is separately permitted under the SST Part A permit (DOE/RL-88-21) and is not a part of this proposed action but is included for reference.

Wastewater from the proposed demonstration Bulk Vitrification Test and Demonstration Facility will be recycled and re-used in future batches treated in the system to the extent practicable. Residual wastewater will be transported to and disposed of in the Liquid Effluent Retention Facility (LERF), the Effluent Treatment Facility (ETF), or the Treated Effluent Disposal Facility in the 200 Area (200 Area TEDF), as appropriate. Each of these facilities is currently permitted and operating. No additional permits are expected to be required for the treatment or storage of wastewater generated by the project.

Air emissions from the project will be permitted under Ecology Air Permit Regulations, (WAC 173-400, 173-401, 173-460, and 173-480). Radioactive air emissions from the project will be permitted under the Washington State Department of Health (WDOH) regulations (WAC 246-247).

Ecology is the lead regulatory agency authorized to approve the application for the Hanford Facility RCRA RD&D permit and for toxic air emissions. The WDOH is the lead regulatory agency for radioactive air emissions. A Notice of Construction (NOC) will be submitted to Ecology for this project and another NOC will also be submitted to the WDOH for radioactive emissions. No other permits are known to be required at this time.

11. Give a brief, complete, description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposed action includes construction, operation, and closure of a demonstration system for the bulk vitrification technology to retrieve and treat specific saltcake tank waste. Testing and demonstration at the proposed facility will continue for approximately 365 operating days in accordance with its RD&D permit. Upon termination of the demonstration project, the Test and Demonstration Facility will be dismantled as a condition of the RD&D permit. The primary purpose of deploying the proposed facility is to fully demonstrate the bulk vitrification technology on Hanford tank waste to verify that the bulk vitrification product will meet applicable disposal requirements while optimizing process conditions. While accomplishing this primary objective, the treatment systems also:

- Minimize the escape of mixed waste into the environment during processing.
- Minimize exposure of plant operating personnel to hazardous process streams.
- Minimize the production of secondary waste streams.
- Ensure that all process byproducts are safe for long-term storage or release into the environment.

The wastes proposed for treatment are liquid salt solution (saltcake) currently stored in Tank 241-S-109, which is a 750,000-gallon SST located in the 200 West Area. To accomplish the project objectives, at least 757,000 liters (200,000 gallons) but not more than 1,135,000 liters (300,000 gallons) of tank waste will be retrieved. The Waste Retrieval System will include waste pretreatment prior to transfer of the waste to the DBVS for treatment.

The Test and Demonstration Facility will be operated in two phases. The objective of Phase I will be to conduct testing of the material treated, which will consist of approximately two percent (2%) by weight of saltcake. Up to approximately 1,135 liters (300 gallons) of saltcake waste will be treated in each container during Phase I. The remainder of the material treated will be simulant (materials similar in chemical composition to waste but without pollutants) and process additives (glass formers). Phase I will include treatment of up to three waste containers.

Phase II will include treatment of up to 50 waste container-loads of saltcake under varying waste material, process additive, and process control parameters. It is anticipated that one container-load of material will be processed weekly over one operating year. The goal of this phase is to optimize the DBVS performance and operation for full-scale use while producing treated waste material meeting U.S. Environmental Protection Agency (EPA) Land Disposal Restrictions (LDRs), 40 CFR 268, and *Hanford Site Solid Waste Acceptance Criteria* (HNF-EP-0063) requirements. Any off-specification material will be re-processed at the permitted Waste Treatment Plant.

The proposed demonstration site is sufficiently level to minimize required site preparation and can provide sufficient land to support process and ancillary equipment for the Test and Demonstration Facility. The proposed location allows close access to electrical power, raw (service) and potable water supplies, steam, sanitary sewer, telephone, and Hanford local area network services. The proposed project would specifically access the electric power lines with the possibility of relocating or adding power poles. Potable water will be transported to the project site and not involve accessing existing water lines. The sanitary sewer system in existing buildings will be used by project personnel or if necessary portable sanitary units would be placed on the project site. There will be no excavation to access water or sewer lines.

The facility will make use of existing buildings and infrastructure to the maximum extent possible. Some infrastructure elements may be modified, augmented, or added. Potential areas include:

- Utilities (water, electric power, sanitary sewer, steam)
- Communications (telephone and computer)
- Roadways
- Radioactive material containment
- Hazardous material containment
- Secondary waste storage/transfer systems
- Treated waste storage/transfer systems.

Bulk vitrification is an in-container vitrification process that involves the batch treatment of saltcake in a refractory-lined steel container. Bulk vitrification is a proven technology on other wastes, including radioactive wastes, but this demonstration project will collect data to determine effectiveness on complex Hanford Site saltcake tank waste. The DBVS will rely on commercially or near commercial off-the-shelf components with proven reliability and compatibility.

The major components and systems of the Test and Demonstration Facility will include trailer-mounted and skid-mounted equipment suitable for field installation, operation, and removal at the completion of the project. The major components, systems, and areas include:

- Waste retrieval system
- Waste staging tank and pumps
- Waste receipt tanks and pumps
- Process additive storage/handling
- Waste feed preparation (mixer dryer unit)
- Vitrification container preparation system
- In-container vitrification system
- Electrical equipment
- Off-gas treatment system
- Control and data acquisition system
- Container storage, and
- Secondary waste storage and handling.

The saltcake received at the Test and Demonstration Facility will be mixed with appropriate glass formers and excess liquid will be removed from the mixture. The mixture will be carried and distributed into a waste container, where electrodes, penetrating the waste mixture, will vitrify the waste via joule heating.

The anticipated waste container is a roll-off type box approximately 7.3 meters (m) (24 feet [ft]) long, 3.0 m (10 ft) high, and 2.4 m (8 ft) wide. Prior to waste distribution into the box, the box will be lined with insulation and refractory material. A box lid will be sealed onto the box prior to waste deposition into the box and will have several ports to facilitate the input of waste, the electrical connections of the electrodes, and the venting of off-gases. The waste container is sealed and the vitrified mass is immobile which therefore prevents release of the waste constituents to the environment and protects human health and safety.

After completion of the vitrification process, insulating/shielding sand will be added to sufficiently fill the void container volume. The waste and waste container will then undergo cooling, sampling, and external decontamination as required. It is anticipated that final cooling will be required before disposal. Final cooling may occur at designated cooling stations along the process line or at an interim storage location. The final vitrified waste form and box will be removed from the DBVS for testing and storage at the Test and Demonstration Facility during the RD&D permit duration. Storage after termination of the RD&D permit will be at a permitted onsite facility.

Temporary storage for up to 50 treated waste containers will be located at the north end of the Test and Demonstration Facility. At the completion of RD&D activities, containers will be transported to the Integrated Disposal Facility or to another permitted disposal facility.

12. **Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

The location of the proposed site for the demonstration project facility is shown on Figure 1. The site is located immediately west of the 241-S Tank Farm, in the 200 West Area of the Hanford Site, Benton County, in eastern Washington. The proposed demonstration facility will be located outside of the tank farm fence but within a highly disturbed area.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. **General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other**

The 200 West Area tank farms are flat.

b. What is the steepest slope on the site (approximate percent slope)?

The approximate slope of the land is less than 2 percent.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

The surface and near-surface soils in the 200 Areas generally are not well developed and consist of a number of soil types such as Rupert sand, Burbank loamy sand, and Ephrata sandy loam.

- Rupert sand consists of coarse sand and covers the majority of the 200 West Area.
- Burbank loamy sand is coarse-textured and covers approximately one-third of the 200 West Area.

Soils at the Hanford Site tank farms, including 241-S Tank Farm and the immediately adjacent areas, have been previously disturbed so there will be only a small amount of additional surficial soil disturbance during the construction of the demonstration facilities; to the extent practicable, existing facilities will be used. At the site, there will be temporary soil disturbance primarily in the trample zone around work areas, heavy equipment traffic areas, and material lay-down areas. Temporary impacts may include soil compaction. None of the soils that will be disturbed have been designated as prime or unique farmlands.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

No unstable soils have been identified.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

The Test and Demonstration Facility will be sited on land that will require minimal surface preparation. The surface area, approximately 3 acres, for the demonstration project represents a limited short-term commitment to the project and any impacts will be limited in extend and duration.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No increase in erosion is anticipated as a result of the construction of the facilities. Standard surface water and erosion control measures will be implemented during construction activities to mitigate potential erosion (see response to B.1.h below).

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

As indicated above, existing facilities will used to the extent practicable. It is estimated that less than approximately 30 percent of the site (approximately 0.75 acre) will be covered with impervious surfaces. However, these are not permanent facilities and there will be no long-term commitment of the site to impervious surfaces.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Standard construction practices for erosion and sediment control will be used at sites requiring any ground preparation for constructing required facilities. Standard erosion/sediment control techniques may include sediment fences, straw bales, or other similar sediment catchments, as necessary. All waste/contaminated equipment will be stored in compliance with regulatory requirements. The RD&D permit conditions will be met to ensure that potential impacts are appropriately mitigated.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Routine construction traffic and activities in and around the 241-S Tank Farm for construction of the proposed Test and Demonstration Facility could generate some fugitive dust. Mitigation of fugitive dust may include wetting the area and avoiding intrusive activities during high winds. The operating DBVS will include thermal treatment processes that could generate particulates and inorganic and organic compound emissions. The facilities will include high-efficiency particulate air (HEPA) filtration systems and other active air treatment systems to mitigate these air emissions (see B.2.c).

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

There are no off-site sources of emissions or odors that will affect the proposed Test and Demonstration Facility.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

The DBVS will include a carbon filter, a sintered metal filter, selective catalytic reduction (SCR), and scrubbers to mitigate fugitive dust, organic compounds, oxides of nitrogen (NOx), and acid gases. Exhaust emissions will then pass through HEPA filters. The system will include radiation monitors in the exhaust stack to verify the emissions and will automatically shut down the systems upon failure of the air treatment systems. The NOC approval conditions will be met to ensure that potential impacts to the air resources are appropriately controlled to ensure protection of human health and the environment.

3. Water

a. Surface:

1) **Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

The Test and Demonstration Facility will not be sited or operated near any surface water bodies. The Columbia River is 9 kilometers (km) (5.6 miles) north of the Central Plateau (200 Areas) (BHI-01119). There are no naturally occurring water bodies near the Hanford tank farms.

The Test and Demonstration Facility is not a land-based facility as defined in WAC 173-303-282(3)(h). A land-based facility would be required under WAC 173-303-282(6)(c)(i)(B)(II) to be located at least 402 m (1,319 ft) from any perennial water body. Similarly, WAC 173-303-282(6)(d)(ii) requires that a land-based facility be located at least 402 m (1,319 ft) from any wetlands, designated critical habitats, habitats designated by the Washington State Department of Wildlife as essential to the maintenance or recovery of any state listed threatened or endangered wildlife species, natural areas that are acquired or voluntarily registered or dedicated by the owner, or state or federally designated wildlife refuges, preserves, or bald eagle protection areas.

2) **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

The Test and Demonstration Facility will not require any work over, in, or adjacent to any surface water.

3) **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

There will be no fill or dredge material placed in or removed from surface water or wetlands.

ation Map of 241-S Tank Farm, and Surrounding Facilities in the 200 West Area

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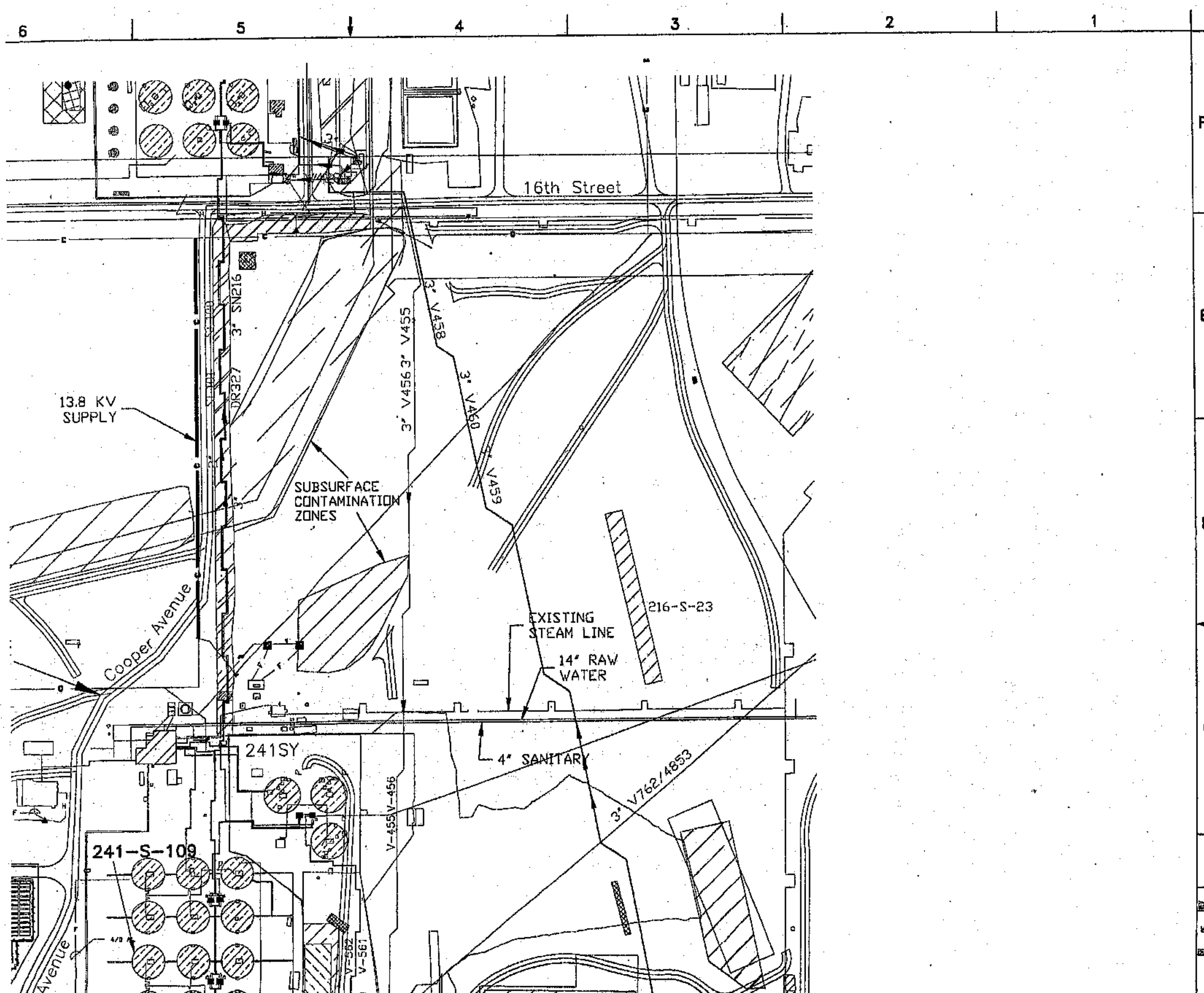

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

The Test and Demonstration Facility will not require any surface water withdrawals or diversions. All water for the 200 West Area is supplied from the Hanford Site water system. Water is distributed throughout the area by the following separate systems:

- Raw water system – Raw water is untreated, non-chlorinated water used primarily for cooling, flushing, and dilution.
- Sanitary water system – Sanitary water is treated (filtered, purified) and used for drinking and sanitary facilities.

The potable water requirements for the Test and Demonstration Facility will rely on existing developed water supply capabilities and will not require new surface water withdrawals or diversions. The DBVS may recycle and reuse wastewater extracted from the processing to the extent practicable for waste conditioning.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No. The Test and Demonstration Facility will not be located within a 100-year floodplain.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

There will be no discharge of waste material to surface waters. Waste conveyance will be via hose-in hose transfer line systems that mitigate the potential for releases.

b. Groundwater:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

There will be no groundwater withdrawals or discharge of water to the groundwater as part of the Test and Demonstration Facility.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals, agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

The question is not applicable to the Test and Demonstration Facility.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

The Hanford Site receives 15 to 18 centimeters (cm) (6 to 7 inches [in.]) of annual precipitation. Runoff from the Test and Demonstration Facility will be directed into the adjacent soils.

2) Could waste materials enter ground or surface waters? If so, generally describe.

There is virtually no potential for waste material to enter groundwater or surface waters from the Test and Demonstration Facility. The waste transfer system will use hose-in-hose transfer lines for waste conveyance outside of secondary containment and the waste tanks and processing equipment will have secondary containment to mitigate the risk of releases. Additionally, the systems will be designed with alarms and interlocks to mitigate the risk of release.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

No surface, ground, or runoff water impacts are expected. As previously noted in B.1.h, standard construction practices for sediment/erosion control will be used as appropriate to protect surface waters. As also indicated above in B.3.c.2, secondary containment for the waste conveyance and the processing systems as well as interlock systems to stop pumps and isolate leaks will be used to mitigate releases.

4. Plants

a. Check or circle types of vegetation found on the site:

______ deciduous trees: alder, maple, aspen, other

______ evergreen trees: fir, cedar, pine, other

__X__ shrubs

__X__ grass

______ pasture

______ crop or grain

______ wet soil plants: cattail, buttercup, bulrush, skunk cabbage, other

water plants: water lily, eelgrass, milfoil, other

______ other types of vegetation

The most common native vegetation community in the vicinity of the 200 West Area is the sagebrush and bunch grass community. Vegetation growth in the tank farm areas is controlled. The area where the Test and Demonstration Facility will be sited is generally denuded of vegetative cover.

b. What kind and amount of vegetation will be removed or altered?

The area around the 241-S Tank Farm has limited vegetation. The area has been disturbed extensively by past activities. The area where the Test and Demonstration Facility will be sited is generally denuded of vegetative cover. The amount of vegetation that may be removed or altered would be less than approximately 2.5 acres.

c. List threatened or endangered species known to be on or near the site.

There are no endangered or threatened species of plants in the vicinity of the 241-S Tank Farm.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Not applicable.

5. Animals

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site: birds: hawk, heron, eagle, songbirds, other; mammals: deer, bear, elk, beaver, other; fish: bass, salmon, trout, herring, shellfish, other.

Information on animals can be found in PNNL-6415. Wildlife sitings within the tank farms in the 200 West Area where the Test and Demonstration Facility will be located are infrequent because of the minimal vegetation that is controlled, as indicated above, which limits viable habitat. The 200 West Area is an industrial-use area that also has limited wildlife habitat. The shrub-steppe and grassland habitats outside of the project area have been found to support:

- Large game animals, such as the Rocky Mountain elk and mule deer
- Predators, such as coyotes, bobcats, and badgers
- Herbivores, such as Great Basin pocket mice, deer mice, harvest mice, ground squirrels, voles, and black-tailed jackrabbits
- Passerine birds, such as western meadowlarks, horned larks, billed curlews, and vesper sparrows
- Upland gamebirds, such as partridge, California quail, and ring-necked pheasants
- Reptiles, such as lizards and snakes.

Neither the shrub-steppe, grassland habitats, or wildlife of the area are expected to be impacted by the proposed project.

b. List any threatened or endangered species known to be on or near the site.

There are no endangered or threatened species or their habitats in the area of the proposed Test and Demonstration Facility nor are there any known nesting areas in the vicinity of this proposed facility. There will be no impacts to this resource or habitat. Two federal and state listed threatened or endangered species have been identified on the 1,517-square kilometer (586-square mile) Hanford Site along the Columbia River, the bald eagle and the peregrine falcon. In addition, the state-listed white pelican, sandhill crane, and ferruginous hawk also occur on or migrate through the Hanford Site. The Columbia River is approximately 10.8 km (6.7 mi) from the 241-S Tank Farm (BHI-01119).

c. Is the site part of a migration route? If so, explain.

The Hanford Site is a part of the Pacific Flyway. Waterfowl do not utilize the Hanford Tank Farms.

d. Proposed measures to preserve or enhance wildlife, if any:

This proposed project contains no specific measures to preserve or enhance wildlife.

6. Energy and natural resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The proposed Test and Demonstration Facility will utilize existing facilities and the existing utility infrastructure to the extent practicable. The operation of the DBVS will have an electrical demand of approximately 1.2 megawatts, which will be provided at the 241-S Tank Farm from the Hanford power grid. Diesel fuel will be used for the backup generator and the boiler system.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No, the proposed Test and Demonstration Facility will not impact the potential use of solar energy by adjacent properties.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Energy consumption of this thermal process is high, and design of energy conservation features is challenging. To improve energy transfer in the bulk vitrification system, graphite will be added to the waste mixture to improve conductivity thereby providing optimal glassification while minimizing electrical demand.

7. Environmental health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

Possible environmental health hazards to workers could result from activities at the proposed Test and Demonstration Facility, including potential exposure to radioactive, dangerous, or mixed waste. The DBVS will be automated, remotely controlled, and remotely monitored to the extent practicable to maintain distance and shielding between the waste and the operators. System alarms and interlocks will be designed to prevent spills and minimize the risk from releases. Further, engineered barriers and administrative controls will be used to minimize the probability of even a minor accident or incident; engineered barriers and administrative controls will also mitigate inherent exposures where personnel are required proximate to the waste. Operations training will mitigate potential worker errors causing a release, response training will mitigate consequences of a release, and personal protective equipment (PPE) will mitigate potential worker exposure. A chemical spill, release, fire, or explosion could occur only as a result of a simultaneous breakdown in multiple barriers and containment systems.

The proposed project will be constructed and operated to meet applicable environmental health and safety standards. These provisions, which will be in the RCRA RD&D permit issued by Ecology, will mitigate the potential for exposure to toxic chemicals, risk of fire, and the exposure to, or spill, of hazardous waste (RPP-19135).

1) Describe special emergency services that might be required.

Hanford Site security, fire response, and ambulance services are on-call at all times in the event of an emergency. Hanford Site emergency services personnel are specially trained to manage a variety of circumstances involving chemical and/or mixed waste constituents and situations.

2) Proposed measures to reduce or control environmental health hazards, if any:

All personnel will be trained to follow proper procedures during operations to minimize potential exposure. Chemical and radiological safety hazards will be mitigated by preventing direct contact with the residual chemical constituents, wearing protective clothing, providing appropriate training of project personnel, and controlling ingress and egress at the site. The proposed Test and Demonstration Facility will have systems for air emission controls, radiation monitoring, fire protection, and alarm capability. Air locks will be used while the ventilation system maintains a negative air pressure in the operation portions of the system to prevent airborne contaminants from escaping directly into the atmosphere. The air will flow from the areas with the lowest potential for contamination toward the areas with a higher potential for contamination. The ventilation system will exhaust the air through a redundant HEPA filtration system before discharging to the atmosphere. The processing systems will have independent air effluent treatment systems as further described in Section B.2.c.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

The Hanford Site is an industrial complex and generates noise at levels that are consistent with the various activities conducted within the complex boundaries. Noise levels are maintained within prescribed limits. Because of the size of the Hanford Site, its scattered facilities, and its largely undeveloped nature, activities generally have no off-site noise impacts.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

No substantial change in noise levels is anticipated due to the operation of the Bulk Vitrification Test and Demonstration Facility. While the bulk vitrification technology will use industrial equipment that generates noise, the noise levels generated will be within levels currently generated and will not constitute an increase in noise levels. The noise will also generally be confined to the area within the Test and Demonstration Facility. As indicated above, because of the size of the Hanford Site, its scattered facilities, and its largely undeveloped nature, activities generally have no off-site noise impacts.

3) Proposed measures to reduce or control noise impacts, if any:

The operations will be contained within the proposed facilities dampening noise levels adjacent to the facilities. No further sound dampening or insulation will be implemented. If Occupational Safety and Health Administration noise standards will be exceeded (*Noise Control Act of 1972*), appropriate measures to protect personnel will be employed (e.g., ear muffs, ear plugs, etc.).

8. Land and shoreline use

a. What is the current use of the site and adjacent properties?

The Hanford Site is a single RCRA facility identified by the EPA/State Identification Number WA7890008967 that consists of over 60 treatment, storage, and disposal units conducting dangerous waste management activities. These treatment, storage, and disposal units are included in the *Hanford Facility Dangerous Waste Part A Permit Application* (DOE/RL-88-21). The Hanford Site consists of all contiguous land, structures, other appurtenances, and improvements on the land used for recycling, reusing, reclaiming, transferring, storing, treating, or disposing of dangerous waste, which, for the purposes of RCRA, are owned by the U.S. Government and operated by DOE (excluding lands north and east of the Columbia River, river islands, lands owned or used by the Bonneville Power Administration, lands leased to Energy Northwest, and lands owned by or leased to Washington State).

The current use of the Hanford Site includes a series of tank farms that are used to store hazardous and radioactive wastes, including liquids and sludges.

b. Has the site been used for agriculture? If so, describe.

The Hanford Site has not been used for agriculture since 1943. Prior to 1943, portions of the Hanford Site, particularly near the abandoned Hanford and White Bluff town sites, supported fruit orchards. Based upon review of available documents, the 200 West Area was not used for agriculture.

c. Describe any structures on the site.

There is a substantial amount of ancillary equipment (e.g., pits, transfer lines, ventilation equipment, vaults, and diversion boxes) within the 241-S Tank Farm, which will remain in place and undisturbed. The proposed project site is located outside of the 241-S Tank Farm fence on a site that does not contain ancillary equipment. Existing electric distribution lines will be used during this project but no new connections to potable water lines or sanitary sewer lines will be made. Limited structures are available outside of the 241-S Tank Farm fence in the area where the project is proposed to be located, but existing structures will be used to the extent practicable as previously indicated.

d. Will any structures be demolished? If so, what?

There will be no structures demolished as part of the proposed Bulk Vitrification Test and Demonstration Facility.

d. What is the current zoning classification of the site?

The Hanford Site is zoned by Benton County as an unclassified use district.

e. What is the current comprehensive plan designation of the site?

The 1985 *Benton County Comprehensive Land Use Plan* designates the Hanford Site as the "Hanford Reservation" (BCBCC, 1985). Under this designation, land on the Hanford Site can be used for "activities nuclear in nature." Non-nuclear activities are authorized "if and when DOE approval for such activities is obtained." The Hanford Comprehensive Land-Use Plan Environmental Impact Statement Record of Decision (64 FR 61615) stated that the Central Plateau (200 Areas) geographic area is designated industrial-exclusive.

f. If applicable, what is the current shoreline master program designation of the site?

Not applicable to the 200 West Area.

g. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

h. Approximately how many people would reside or work in the completed project?

During the operation of the proposed Bulk Vitrification Test and Demonstration Facility, less than 50 people will work on the project.

i. Approximately how many people would the completed project displace?

The proposed Bulk Vitrification Test and Demonstration Facility will not displace any people.

j. Proposed measures to avoid or reduce displacement impacts, if any:

Does not apply.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Does not apply (refer to Section 8f).

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Not applicable. No housing units will be provided.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

Not applicable. No housing units will be eliminated.

c. Proposed measures to reduce or control housing impacts, if any:

Not applicable. There are no housing impacts associated with the operation of the proposed Bulk Vitrification Test and Demonstration Facility.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The tallest feature associated with the proposed Bulk Vitrification Test and Demonstration Facility will be the air effluent stack that will be less than approximately 15 m (50 ft) above the ground surface. The primary building material of the exterior surface is metal that will be painted. All features and equipment associated with the proposed project can be considered to be at ground level.

b. What views in the immediate vicinity would be altered or obstructed?

There will be no views altered or obstructed as a result of the proposed Bulk Vitrification Test and Demonstration Facility because of the existing facilities and equipment in the region.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Not applicable.

11. Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Lighting will be provided outside of the proposed Bulk Vitrification Test and Demonstration Facility for security and safety from dusk to dawn. Lighting will be from fixed mounted, industrial halogen lamps. The proposed Bulk Vitrification Test and Demonstration Facility will not produce a glare.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No. Exterior lighting will improve safety in the area and will not interfere with views. Standard industrial outdoor lighting will be installed for safety and security. The lighting will be consistent with the existing lighting throughout the 200 West Area.

c. What existing off-site sources of light or glare may affect your proposal?

There are no off-site sources of light that will affect the proposed Bulk Vitrification Test and Demonstration Facility.

d. Proposed measures to reduce or control light and glare impacts, if any:

Not applicable, there are no impacts associated with lighting or glare created by the proposed Bulk Vitrification Test and Demonstration Facility.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

There are no designated or informal recreational opportunities in the immediate vicinity of the proposed Bulk Vitrification Test and Demonstration Facility.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No. There are no existing recreational uses of this industrial area.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Not applicable. There are no impacts on recreation or on recreation opportunities created by the proposed Bulk Vitrification Test and Demonstration Facility.

13. Historic and Cultural Preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.
The waste storage tanks could be considered of potential historical significance because they represent activities during the World War II and Cold War periods. Typically, contaminated structures of historical value would have their history and use documented but would not be preserved intact. DOE has received an exemption that would allow documenting only one SST, one DST, and one inactive miscellaneous underground storage tank rather than documenting each tank individually (DOE/RL-96-77). The proposed Bulk Vitrification Test and Demonstration Facility will not affect the ability for this documentation to occur.

The Hanford Site tank farms underwent extensive excavation when the tanks were installed underground. It is unlikely that any archaeologically significant resources will be encountered during the construction of the proposed Bulk Vitrification Test and Demonstration Facility, and any that may be encountered would likely not be in their original cultural context. Notwithstanding this situation, in the event cultural resources are encountered during the activities, work will be halted and the NEPA compliance officer, qualified archaeologist, and state historic preservation officer will be notified to determine the appropriate disposition of the resource and any mitigative actions that will be required prior to continuing with the project.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

Consideration of impacts to cultural resources is mandated under Section 106 of the *National Historic Preservation Act* implemented by 36 CFR 800. Requirements include identification of significant historic properties that may be impacted by the proposed action or alternatives within the project's area of potential effect. Historic properties are defined as archaeological sites, standing structures, or other historic resources listed in or determined eligible for listing in the *National Historic Preservation Act*. If adverse effects on historic, archaeological, or cultural properties are identified, agencies must attempt to avoid, minimize, or mitigate the impacts to these resources.

The Hanford Site as a whole contains extensive prehistoric and historic archaeological sites. However, the 200 West Area contains very few known prehistoric or historic archaeological sites. A comprehensive archaeological resources review for the fenced portions of the 200 Areas was conducted in 1987 and 1988 (PNNL-6415). Two historic archaeological sites, four isolated historic artifacts, one isolated cryptocrystalline flake, and an extensive linear feature (White Bluffs Road) were the only materials greater than 50 years old discovered during the field survey. Only the White Bluffs Road was determined eligible for listing on the National Register of Historic Places. This road, which passes diagonally southwest to northeast through the 200 West Area, originated as a Native American trail. Segments of the White Bluffs Road that are located in the 200 West Area have been determined to be non-contributing. Such non-contributing segments of the White Bluffs Road are those that do not add to the historic significance of the road but retain evidence of its contiguous bearing.

c. **Proposed measures to reduce or control impacts, if any:**
Does not apply.

14. Transportation

a. **Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on-site plans, if any.**

Does not apply.

b. **Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?**

The Central Plateau is not accessible to the public and is not served by public transit.

c. **How many parking spaces would the completed project have? How many would the project eliminate?**

Existing parking areas will be used in the 241-S Tank Farm area. If additional parking is necessary, the parking will be designated within the construction footprint around the perimeter of the proposed Bulk Vitrification Test and Demonstration Facility. No existing parking spaces will be eliminated.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

There will be no new permanent roads, streets, or improvement to the road network because the proposed Bulk Vitrification Test and Demonstration Facility will be sited adjacent to existing roads. Access from the existing road network to the proposed Bulk Vitrification Test and Demonstration Facility (i.e., driveways) will be within the construction footprint for the facilities.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The project will not use water, rail, or air transportation. Transportation of the construction material onto the Hanford site will be via truck. Movement of the waste containers onsite will also be by truck.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

On/off-site vehicular trips will consist of up to three shift changes that could involve up to 150 round trips per day (assuming no car pooling). Interim storage of the waste boxes will be at the Bulk Vitrification Test and Demonstration Facility during operation under the RD&D permit and so no onsite transportation of filled waste boxes will be required until closure of the DBVS. Transport of any wastewater not otherwise processed in the DBVS will be shipped to the LERF, ETF, and/or 200 Area TEDF approximately each week. It is anticipated that wastewater from the waste dewatering process will be limited and stored at the demonstration facility pending transfer for treatment and disposal such that approximately two vehicle trips per week will be required.

g. Proposed measures to reduce or control transportation impacts, if any:

Waste containers will be stored at the Bulk Vitrification Test and Demonstration Facility pending final disposition onsite at the termination of the RD&D permit. Transport of liquid effluent to the LERF, ETF, 200 Area TEDF will occur within the 200 Areas. No transportation impact mitigation is anticipated.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

Electricity, potable water, steam, refuse service, telephone, and a sanitary sewer system are available in the 200 Areas.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity, which might be needed.

The following utilities are currently available at the 241-S Tank Farm and will be used during the project. Electricity will be required to operate the proposed DBVS and its air treatment/filtration system; operate the heating, ventilation and air conditioning (HVAC); provide lighting; and provide general electricity demands of the support systems at the Bulk Vitrification Test and Demonstration Facility. Electricity is available at the tank farm to provide service, but a 1,200 kw emergency generator will also be installed as backup during power outages to maintain operation of the offgas treatment system and to permit a controlled shut-down of the DBVS until power from the Hanford Site power grid can be restored. Potable water will be required for operational support and for the proposed demonstration project operations. Water is also available at the tank farms. Sewer service will be required and is available in the tank farm area.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Roy J. Schepens ______________________ [illegible] ______________

Roy J. Schepens, Manager
U.S. Department of Energy
Office of River Protection

Date

REFERENCES

10 CFR 1021, "National Environmental Policy Act Implementing Procedures," *Code of Federal Regulations*, as amended.

36 CFR 800, "Protection of Historic and Cultural Properties," *Code of Federal Regulations*, as amended.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program," *Code of Federal Regulations*, as amended.

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WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-303-282, "Siting Criteria," *Washington Administrative Code*, as amended.

WAC 173-303-640, "Tank Systems," *Washington Administrative Code*, as amended.

WAC 173-303-809, "Research, Development, and Demonstration Permits," *Washington Administrative Code*, as amended.

WAC 173-400, "General Regulation for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 173-401, "Operating Permit Regulation, Insignificant Emissions Units and Major Source Definition Amendments," *Washington Administrative Code*, as amended.

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, as amended.

WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," *Washington Administrative Code*, as amended.

WAC 197-11, "State Environmental Policy Act Rules," *Washington Administrative Code*, as amended.

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